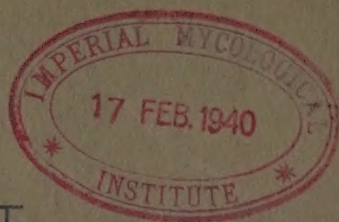


JAMAICA



ANNUAL REPORT

OF THE

Department of Agriculture

FOR THE

YEAR ENDED 31st DECEMBER, 1938.

Ordered by His Excellency the Governor to be Printed.



CONTENTS.

	Page.
SECTION I.—AGRICULTURE IN THE COLONY.	
SECTION II.—WORK OF THE DEPARTMENT OF AGRICULTURE.	
A. PUBLIC GARDENS:	
(i) Report of the Superintendent Public Gardens and Horticulturist. ..	14
B. AGRICULTURAL EXPERIMENTS, EDUCATION AND FIELD SERVICES:	
(ii) Report of Superintendent, Experiment Station, Hope.	18
(iii) Report of Superintendent, Sugar Cane Experiments.	20
(iv) Report of Headmaster, Farm School.	21
(v) Report of Farm Superintendent	23
(vi) Report of Agricultural Superintendent, Government Stud Farm and Experimental Station, Manchester	27
(vii) Report of Senior Veterinary Officer	32
(viii) Report of Forest Officer	39
(ix) Report of Supervising Inspector of Plant Diseases	52
(x) Report of Agricultural Officer	52
(xi) Report of Tobacco Specialist	55
(xii) Report of Chief Inspector of Produce	57
C. RESEARCH AND LABORATORIES:	
(xiii) Report of Deputy Island Chemist	59
(xiv) Report of Entomologist	65
(xv) Report of Agricultural Chemist	69
(xvi) Report of Government Botanist	81
(xvii) Report of Plant Pathologist	90
(xviii) Report of Agricultural Officer in charge of Inspection of imported plants, plant products and agricultural machinery	93
D. PUBLICATIONS:	
List of Departmental Publications issued	94
SECTION III.—FINANCIAL STATEMENTS —	
Accounts of Hope Stock Farm	94
SECTION IV.—LEGISLATION—	
Summary of Legislative Changes affecting Agricultural Industries ..	97

INDEX.

A.	Page	B.	Page.
Ackee, Sterol contents of	77	Botanical Work	81
Advisory Board, Farm School	23	Bougainvillea	14
Afforestation	42	British Industries Fair	6
<i>Aganisthos odius orion</i>	89	Brown Weevil	65
<i>Agave sisalana</i>	92	Bulb Garden, Hope	15
Agricultural Analyses, General	72	Buildings and Improvements:	
Agricultural Education	6, 31	Agricultural Chemist.s Laboratory	80
Agricultural Legislation	97,98	Forestry Division	43
Agricultural Machinery, Importation of	93	Grove Place	31
<i>Aleurocanthus woglumi</i>	89	Hill Gardens	16
American Blight of Coffee	92	Hope Gardens	15
Analyses:		Hope Stock Farm	26
General Agricultural	72	King's House Gardens	17
Chemical	59	Butter	29
<i>Anaplasmosis</i>	34		
<i>Anasa scorbittuca</i>	67		
<i>Anastrepha longimacula</i>	67		
Animal Bye-Products	39		
Animal Health	6, 33, 34, 36		
Animal Husbandry	32 33		
<i>Annona squamosa</i>	89		
Ant, Fire	90		
Anthrax	33, 36		
Aphids	67, 90		
<i>Aphis gossypii</i>	89		
<i>Aphis illinoisensis</i>	89		
<i>Aphis maidis</i>	67		
Apiaries	39		
<i>Arachis hypogea</i> see Groundnut			
<i>Argyreia speciosa</i>	90		
Arsenical Poisoning	34		
Arsenite of Soda, Sales of	38, 65		
<i>Asterolecanium pustulans</i>	90		
Attagenus sp.	67		
Aviary, Hope Gardens	15		
Avocado Pear	52		

D	Page	H.	Page
<i>Diplocarpon rosae</i>	93	Haiti, Cercospora Leaf Spot in	91
Dipping Tanks	38	Hides and Skins exported	37
Diseases of Animals	6, 33, 34, 36	Hill Gardens, Cinchona	16
Diseases of Plants	90, 93	Hog Cholera	33
<i>Disomycha laerigata</i>	67	Honey	58
Distribution of Plants:		Hope Gardens	14
Cane	18	Horn Worm	67
Citrus	53, 54		
General	15, 16, 17		
		I.	
E.		Importation of Agricultural Machinery	93
Eddie Wasp (see also <i>Eretmocerus sericus</i>)	19	Do. Baby Chicks	38
Egg Plants	28	Do. Fruit and Vegetables	93
Elephant Grass	27	Do. Livestock	38
<i>Epitrix parvula</i>	67	Do. Plants	93
<i>Eretmocerus sericus</i>	19, 89	Do. Seed Potatoes	93
Exhibition, Glasgow	6	<i>Indigofera endecaphylla</i>	27
Exhibition, Floral	15	Infectious Bovine Abortion	35
Experiment Station, Hope	18	Insect Pests	20, 21, 65, 89, 93
Exports:		Insecticides	68, 90
General	2	Inspection of Imported Plants, etc.	93
Hides and skins	37	Inspectors of Plant Diseases	52
Livestock	37	International Horticultural Conference, Berlin	90
		Introduction of Beneficial Insects	67
		J.	
F.		Jamaica Agricultural Society	6
Farm School (see Government Farm School)		Jamaica Association of Sugar Technologists	78
Feeds and Crops, Hope Stock Farm	26	Joint Ill	34
Fern Gully	17		
Fertilizer Trials, Grove Place	27	K.	
Fiddler Beetle	28, 53, 67, 89	King's House Gardens and Grounds	17
Flood Damage	45		
Fly Killer, Sales of	65	L.	
Fodder Crops	27	Laboratory Fees	65
Food Crops:		Laboratory Sales	65
Investigations with	72	Laboratory Staff	65
Seed Supplies	73	Labour Unrest	34, 45
Establishment of Centres	73	<i>Lachnosterna jamaicensis</i>	66
Foodstuffs, Analysis of	77	Land Settlement	40, 80
Foot and Mouth Disease	33	Lectures	31
Forest Area	40	Legislation, Agricultural	39, 97, 98
Forest Branch	39	<i>Ligyris tumulosus</i>	66
Finance	44	Lima Bean	92
Administration	44	Limes	4, 92
Forest Law	39	Livestock:	
Forest Produce Rules	42	at Grove Place	29, 30
Forest Research	43	at Hope Farm	23
Forest Reserves	40, 41, 47, 48	Diseases of	33
Forestry	6, 15	Exports of	37
Foul Brood Disease of Bees	39	Imports of	24, 37
Fruit Fly	67	Industry	5, 36
		Marketing of	33
G.		Sales of	24, 31, 32
Gall-sickness	34		
<i>Gardenia citrodora</i>	16	M.	
<i>Gardenia commadore</i> var. <i>Stringher</i>	16	Maize, Analysis of	77
<i>Gerbera Jamesonii</i>	15	Do. Fertilizer Trials	73
<i>Gloeosporium</i>	92	Mane Stock, Grove Place	29
<i>Gloeosporium pestis</i>	92	Mango	19, 89
Gordon Town Garden	17	Mango Budding Campaign	52
Government Farm School, Hope:		Do. Insect Pests of	67
Advisory Board	23	Do. Sales	26
Demonstration Plots	23	Do. Trees, Removal of	14
Enrollment	6, 21	Marketing Division	4, 28
Extension Work	23	Maroons	45
Graduation	22	McIntosh, Dr. A. E. S.	21
Report on	21	Mealy Bug	67
Scholarship	22	Meat Supply	37
Sports	22	Mediterranean Fruit Fly	65
Student Christian Movement	22	<i>Melamasius sericeus</i>	69
Staff	23		
Tours	23		
Visitors	23		
Government Stock Farm, Hope	23, 32, 34		
Grape Vine	89		
Green Scale	19		
Groundnut	27, 73, 77, 92		
Grove Place Stud Farm	27, 32, 36		
Guatemala Grass	27		

[illegible]

DEPARTMENT OF SCIENCE AND AGRICULTURE, JAMAICA.

STAFF.

Director of Agriculture and Island Chemist G. A. Jones, C.M.G., Dip. Agric. (Bangor).

Head Office.

Chief Clerk and Personal Assistant to the Director of Agriculture	George D. Goode, Dip. Agr.
Financial Clerk	N. B. Donaldson
Second Class Clerks	R. S. Nelson, L. A. Boothe.
Librarian	Miss E. Marson.
Assistants, Typists and Stenographers and Temporary Clerks	Miss R. E. White, Miss D. Wyatt, S. M. Rainford, K. A. Wilson, Miss H. L. E. Chambers, Miss S. J. Russell, Miss E. D. Limonius, V. O. Williams.

Public Gardens.

Superintendent and Plant Breeder	M. S. Goodman.
Horticulturist	E. J. Downes.
Assistant	Miss D. Gray.

Agricultural Experiments, Education and Field Services.

Actg. Agricultural Superintendent ..	L. L. Carrington, Dip. Agr.
Superintendent, Sugar Cane Experiments	M. S. Goodman.
Acting Agricultural Officer ..	H. C. Miller, D.I.C.T.A.
Tobacco Specialist	F. W. Winckley.
Headmaster, Farm School ..	J. W. Howe, B.S.A., M.Sc.
Assistant Masters	J. M. McEwen, D.I.C.T.A., H. C. Virtue, V. A. Valen- tine.
Temporary Clerk	Miss M. Goodman.
Agricultural Superintendent, Grove Place Stud Farm and Experimental Station	L. A. Powell.
Supervising Inspector of Plant Diseases	J. B. Sutherland.
Inspector of Plant Diseases. ..	19 Inspectors.

Live Stock.

Senior Veterinary Officer ..	S. Lockett, V.M.D.
Technical Assistant	W. F. Hutchinson.
Superintendent, Hope Stock Farm ..	J. W. Howe, B.S.A., M.Sc.
Foremen, Hope Stock Farm ..	G. E. Redshaw, R. A. Amiel.
Clerk and Storekeeper, Hope Stock Farm	L. S. Marston.
Stock Inspector	T. P. Lecky, B.S.A.
Superintendent of Stock, Grove Place Stud Farm	E. U. Lewis.
Clerk, Grove Place Stud Farm ..	R. N. Lewis.
Temporary Clerk, Grove Place Stud Farm	Miss M. Masters.

Research Laboratories.

Deputy Island Chemist ..	W. L. Barnett, M.A., B.Sc., F.I.C.
Entomologist	W. H. Edwards, D.I.C., F.E.S.
Agricultural Chemist	H. H. Croucher, B.Sc.
Botanist	L. N. H. Larter, B.Sc., A.R.C.S., A.I.C.T.A.
Plant Pathologist	F. S. Ward, B.S.A.
Assistant Chemist	E. N. Richards
Temporary Assistant to Agricultural Chemist	W. K. Mitchell, D.I.C.T.A.
Junior Agricultural Officers ..	E. A. Tai, D.I.C.T.A.; W. G. Stuart, D.I.C.T.A.; L. B. Robinson,
Technical Assistants	E. K. P. Blake, O. W. Harrison, C. D. F. Hutchings, W. B. Dixon, Z. A. Daniels, D. A. L. Segre, J. H. Haughton, G. A. Little, R. D. Hill, K. A. Gayle, R. K. Richardson.
Clerk and Stenographer ..	D. C. Davis.
Typists and Stenographers ..	Miss E. J. Gordon, Miss T. J. Blake.

Forest Branch.

Forest Officer	C. Swabey, B.Sc.
Forest Settlement Officer	E. Brown.
Typist and Stenographer	Miss P. B. Alexander.
Forest Guards	8 Forest Guards.
Forest Watchers	8 Forest Watchers.

Produce Protection.

Chief Inspector of Produce	P. W. Murray.
Inspectors of Produce	R. C. Somerville, A. M. Douet, H. B. Monteith, I. H. Campbell, C.M.G. Purchas, T. V. Thomson.
Secretary	Miss U. E. Foster-Davis.
Typist and Stenographer	Miss C. D. Levy.

Marketing Division

Development and Marketing Officer	F. E. V. Smith, B.Sc.
Manager	G. K. Argles.
Asst. Manager	E. G. Whitbread.
Asst. Manager (Accounting)	R. A. Crosswell
Junior Agricultural Officer	R. C. Bridge.
Field Assistant	W. D. Marr.
Clerk to the Development and Marketing Officer	Mrs. Beryl Vernon.
Temporary Clerk	Miss R. C. McDonald.
Typist and Stenographer	Miss L. Palomino.
Accounting Clerk	W. W. Woolcock.
Mechanic and Electrician	A. J. McDowell.

ADDENDA.

RESEARCH LABORATORIES.

Senior Agricultural Superintendent	...	J. R. V. SMYTH, M.A., Dip. Agri. (Econ.) Cantab.
Assistant Agricultural Chemist.	...	R. F. INNES, B.Sc., A.I.C., Dip. Agri. Cantab. A.I.C.T.A.
Technical Assistant	...	H. M. PETERKIN.



DEPARTMENT OF SCIENCE AND AGRICULTURE.

Report for the Year ended 31st December, 1938.

SECTION I.—AGRICULTURE IN THE COLONY.

A. GENERAL.

The following staff changes took place during the year:—

New Appointments:

- Mr. G. A. Jones, C.M.G., Dip. Agric., Commissioner of Agriculture for the Windward and Leeward Islands, was appointed Director of Agriculture and Island Chemist, as from 11th December, 1938.
- Mr. J. R. V. Smyth was appointed Senior Agricultural Superintendent.
- Mr. R. F. Innes was appointed Assistant Agricultural Chemist.
- Mr. W. G. Stuart was appointed Junior Agricultural Officer.
- Mr. C. D. F. Hutchings was appointed Temporary Senior Technical Assistant to the Agricultural Chemist.
- Mr. R. K. Richardson was appointed Junior Technical Assistant.
- Mr. G. B. Grant was appointed Field Assistant attached to the Marketing Division.
- Mr. Lloyd Gray was appointed Agricultural Assistant, Grove Place.
- Mr. V. O. Williams was appointed a Temporary Assistant in the office of the Botanist.
- Misses E. D. Limonius and P. B. Alexander were appointed Typists and Stenographers.
- Miss T. J. Blake was appointed Temporary Typist and Stenographer.
- Miss R. C. McDonald was appointed Temporary Clerk attached to the Marketing Division.

Promotions:

- Mr. L. L. Carrington, Agricultural Officer, was appointed Acting Agricultural Superintendent, and Mr. H. C. Miller, Junior Agricultural Officer, was appointed Acting Agricultural Officer.
- Mr. L. B. Robinson, Technical Assistant, was promoted a Junior Agricultural Officer, and Messrs. O. W. Harrison and E. K. Blake, Technical Assistants, were promoted Senior Technical Assistants.
- Mr. L. A. Boothe, Clerk and Storekeeper, Government Laboratory, was promoted a Second Class Clerk in the Head Office.
- Mr. I. H. Tomlinson, Foreman, Hope Experiment Station, was promoted a Plant Disease Inspector.

Transfers:

Mr. R. S. Martinez, Agricultural Superintendent, was transferred to the Lands Department, and Mr. N. R. McHardy, Plant Disease Inspector, and Miss V. M. Barrows, Stenographer and Typist, were similarly transferred. Miss E. G. McKay, Assistant in the office of the Superintendent of Public Gardens, was transferred to the Medical Department, and was replaced by Miss D. Gray, Assistant in the Medical Department.

Mr. D. L. Foster, Junior Agricultural Officer, was transferred to a similar post in British Honduras.

Retirements:

Mr. A. C. Barnes, C.M.G., Director of Agriculture, resigned his position as from the 16th October 1938.

Other Officers who resigned were:

Mr. N. A. Wainwright, Plant Disease Inspector.

Messrs. D. A. L. Segre and L. E. Thwaites, Technical Assistants.

Leave.—During the year the following officers were absent on leave:—*Head Office—*

Mr. E. J. Downes, Horticulturist	From 15th August to 11th September.
Mr. R. S. Nelson, Cashier	From 11th July to 10th October.
Mr. K. A. Wilson, Assistant	From 13th October, to 7th December.
Miss D. H. Wyatt, Assistant	From 28th December to end of year.
Miss R. E. White, Typist and Stenographer	From 2nd August to 25th October.

Government Laboratory—

Mr. H. H. Croucher, Agricultural Chemist	From 14th June to 30th October.
Mr. W. H. Edwards, Entomologist	From 28th October to end of year.
Mr. O. W. Harrison, Technical Assistant	From 1st December to end of year.
Mr. J. H. Haughton, ditto	From 4th July to 28th August.
Mr. R. D. Hill ditto	From 18th July to 12th September.

Farm School—

Mr. J. W. Howe, Headmaster	From 28th May to 5th October.
Mr. J. M. McEwen, Assistant Master	From 10th September to 24th September.
Mr. H. C. Virtue ditto	From 11th July to 3rd September.
Mr. V. A. Valentine ditto	From 29th August to 17th September
Miss E. Miles, Matron	From 28th July to 8th August.
Miss M. Goodman, Typist and Stenographer	From 15th August to end of year.

Produce Inspection Division—

Mr. P. W. Murray, Chief Inspector of Produce	From 19th July to 10th October.
Mr. A. M. Doucet, Inspector of Produce	From 21st March to 10th April.
Mr. H. B. Monteith ditto	From 19th September to 29th September.
Miss C. D. Levy, Typist and Stenographer	From 27th June to 29th October.

Marketing Division—

Mr. W. D. Marr, Field Assistant	From 5th December to 17th December.
Mr. A. J. McDowell, Mechanic and Electrician	From 1st July to 31st July.
Mr. Z. A. Daniels, Technical Assistant	From 1st July to 26th August.

Forestry Division—

Mr. C. Swabey, Forest Officer	From 28th June to 14th November.
Mr. L. V. Burns, Forest Guard	1st October to 14th October.

Plant Disease Inspectors—

Mr. R. Glen Campbell, Plant Disease Inspector.	From 27th January to 6th March.
Mr. I. L. Dowden, Plant Disease Inspector	From 17th November to 30th November.

2. All sections of the Island experienced a diminution of rainfall during the year, total rainfall (59.95 ins.) being nearly 14 inches below the previous 60 year average (73.87 ins.).

As a result of low rainfall during the first six months of the year a small decrease in yields per acre was observable in most agricultural crops. In the case of bananas, however, the effect was more than balanced by a decrease in the intensity of infection by *Cercospora* Leaf Spot as compared with the early part of 1937, and in the case of cane by a higher sucrose content.

Precipitation during the fall seasons of the year proved disappointing and while conditions were created eminently suitable for the development of the intensive outbreak of *Cercospora* which manifested itself during the latter months of 1938, the duration of the rainy season was unusually short and as a result many sections of the Island are now passing through a period of acute water shortage.

We are grateful, however, in that we have again been spared the visitation of destructive wind disturbances, while gloomy predictions as to the effect of *Cercospora* Leaf Spot on Banana production in 1938, have not materialised. Total exports of bananas were only 3 million short of the record total of 27 million stem in 1937, while the value of the fruit exported exceeded the value of the previous year's total by over £260,000.

The total value of exports from the Island during 1938, exceeded by £93,800 the value of exports in 1937, and at £4,833,322 constitutes the highest recorded value of principal exports from the Island. This increase has been almost entirely due to the increase in value of bananas and pimento—copra being the only other product which showed an increase in value of total exports during the year.

The unit prices of all agricultural crops, with the exception of bananas and pimento showed a definite decrease during 1938.

THE BANANA INDUSTRY.

The second year of working of the agreement between the Jamaica Banana Producers' Association and the United and Standard Fruit Companies has been a most successful one. This agreement has proved particularly valuable during a period when in many localities there has been a tendency towards the production of a poorer grade of fruit owing to *Cercospora* disease and other disabilities. At such a period inter-company competition with its attendant waste might well have resulted in the exportation of a large quantity of fruit of unsatisfactory quality with the inevitable result of a serious fall in prices.

This grave danger has not only been successfully averted, but from an average price of 193/- per 100 stems, which was the average f.o.b. value of 10½ million stems exported in 1933, an average price of 245/- f.o.b. was realised for nearly 24 million stems exported in 1938.

Panama Disease is a most serious menace to the Banana industry. Its spread maintains steady progress and is enforcing a retreating policy, which is year by year necessitating the utilisation of a larger proportion of lands not ideally suited for bananas. On the advice of the Colonial Advisory Council of Agriculture and Animal Health, steps have recently been taken to accelerate the work of Banana Breeding in the Colony, by providing extended facilities for the operations of the Botanist and by the introduction of new wild varieties from the East, as a result progress has been materially assisted. A total of 3,397 stems were pollinated during the year. 312 seedlings have already been established in the field and a further 306 will shortly be planted out. Of the 158 seedlings which have been under test for immunity to Panama Disease for seven months or more, only 14 have so far shown themselves susceptible to Panama Disease. Sixteen particularly promising seedlings have been selected for more extensive trial and their characteristics and behaviour are being closely observed.

Cercospora Leaf Spot continues to exhibit periodic outbreaks of severe intensity, causing planters much concern from time to time. It has been demonstrated that in high-producing areas where conditions are favourable for the use of power sprays, efficient control of this disease can be economically secured by the adoption of a proper, regular, spraying programme. One of the serious problems which the Department is now endeavouring to solve is the economic protection of crops grown on steep hillsides, where spraying is often rendered impracticable on account of the topography of the land and the scarcity of water. Dusting has proved useful in mild outbreaks but has not afforded adequate protection from intensive attacks of the disease.

Banana Borer.—Further consignments of the predators of the Banana Borer "*Cosmopolites sordidus*" have been received from Fiji and the Federated Malay States. These insects, "*Plaesius jaranus*" from Fiji and "*Dactylosternum abdominale*" from the Malay States have been liberated in various localities where there is an abundance of the borer and conditions are otherwise favourable for their establishment. Individuals of the various species have been recovered from some of the fields several months after liberation, but it would be premature to draw conclusions as to the permanence of their establishment.

Fertiliser Experiments.—The fertiliser experiments commenced under the scheme financed by the Fruit Companies has been continued and the final report on the work will be completed and the results published early in the present year. Information with regard to the effect of fertilizers on bananas was almost entirely lacking when this series of experiments was commenced. Fundamental information has been obtained from these experiments, but further detailed investigations and the extension of the experiments to an even wider range of soil types and climatic conditions will be necessary before the problem can be regarded as solved. In particular, further investigation is required of the minimum requirement of fertilizer application for the banana and of the possibilities of increasing by the use of fertilizer, the population and production per acre. The funds provided by the Fruit Companies will be exhausted early in the present year, but proposals for the continuance of this work have been prepared and submitted.

SUGAR.

The first crop to be operated under the restrictions introduced in Jamaica under the International Sugar Agreement was made during the year. A Law (43 of 1937) to enforce the control required by the Agreement was passed in 1937 and the administration of the law was placed in the hands of a Sugar Control Board, which was appointed on the recommendations of an Advisory Committee set up to co-ordinate the views of the manufacturers, farmers and Government. The Board has registered over 6,000 cane farmers, over 4,000 of which made deliveries in the 1938 crop. A limit was placed on the production of factories. The manufacturers agreed to purchase any cane of good quality offered to them, but conditions prevailed which enabled all the cane produced in the Island, both by estates and farmers, to be ground for sugar manufacture. The export quota for the 1938-39 crop has been reduced to 80,360 tons and it has been necessary to quota Island production as follows:—

Island Production	..	94,490 tons
Island Export Quota	..	80,360 "
Island Local Consumption Quota	..	14,000 "
Island Reserve Quota	..	31,453 "
Island Muscavado Quota	..	230 "

Experience gained during the 1938 crop indicated methods by which the operation of the Law could be improved and these improvements were incorporated in the Sugar Industry Control Amendment Law which was passed by Council in the Autumn Session.

A record sugar crop was produced in 1938, amounting to 118,188 tons. The average yield of cane per acre was 27.91 tons which was rather less than that of the previous year owing to lower rainfall. The highest average yield yet obtained of sugar from cane was produced by factories, an average of 9.92 tons of cane being required to produce a ton of sugar. Two factories used less than 8 tons of cane to manufacture one ton of sugar.

The Jamaican Association of Sugar Technologists continued to operate. The Association aims at the improvement of sugar production in the Island; a Journal is published quarterly. The Annual Conference was held at Hope in December, when papers on various aspects of sugar production were delivered and discussed.

Experiments with new varieties have been continued in co-operation with estates. A limited number of fertilizer experiments have been conducted.

CITRUS.

The volume of citrus exports increased during 1938, and noteworthy improvement in the handling and marketing of fruit has been effected. The adoption of the revised Citrus Regulations under the Produce Law, 19 of 1926, has materially assisted to enhance the reputation of our fruit in foreign markets, with benefit to all concerned.

There is still, however, considerable room for increased efficiency, and the incidence of wastage, particularly between field and packing house, remains unduly high. There also persists a tendency on the part of growers to attempt to sell immature fruit, particularly during the early part of the season.

It is well that growers bear in mind that there is a tendency for prices of agricultural commodities, including citrus, to decline from year to year, and unless steps are taken to lower costs of production and eliminate wastage, profit margins will continue to shrink.

The Department of Agriculture continues to render every possible assistance at all stages of the industry from the distribution of plants to the securing and maintenance of markets. During the year 8,567 plants of Marsh Seedless Grapefruit and 14,453 plants of Valencia oranges have been distributed to growers under the Citrus Development Scheme. The large majority of these plants were set out under the direct supervision of officers of this Department, while follow-up work, including pruning, spraying and manuring, on previous plantings, has been sedulously pursued.

At the Prison Farm, St. Catherine, there are now some 30,000 sour orange seedlings. These are being cultivated by Prison labour and will soon be ready for budding. 100,000 plants are now in process of budding at the Charlton nurseries and will be ready for distribution in 1940. 11,000 budded plants will be available for distribution this year, and 300 quarts of sour orange seed have recently been sown.

A second citrus manurial experiment was launched during the year and work on the experiment at Grove Place has been continued.

The Marketing Division of the Department has rendered valuable assistance in expanding considerably the trade in limes. Exports of fresh limes have continued to show an encouraging increase and fruit unsuitable for export is utilised for the production of Lime Oil.

Citrus prices have shown a disappointing decline during the past year. The demand for grapefruit has been particularly poor and our New Zealand shipments have constituted the sole source of a measure of encouragement. Mainly as a result of the efforts of the Produce Inspection Division of the Department, which has insisted on maintaining a high standard of quality of fruit intended for New Zealand, Jamaica fruit enjoys a favourable reputation in that market and increased orders have been received during the year.

PIMENTO.

Next to bananas, sugar and rum, pimento occupies a leading position in the Island's 1938 export trade. Total exports approximated 9 million pounds, representing an f.o.b. value of £207,070. The Pimento Rust Disease continues to limit production in areas of higher altitude but good crops were reaped in the lower lying centres of production.

Prices have been satisfactory, and though individual producers in certain areas have been hard hit the value of the industry to the Island has increased.

COCONUTS.

Coconut production has increased considerably this year, largely as a result of the recovery of trees from the several hurricane of the 1932-35 period, and the coming into bearing of new plantings. Unfortunately this increased production has coincided with a period of severe depression in the industry, owing to a decline in the price of copra and a falling off of demand in fresh nuts from the United States of America.

TOBACCO.

The development of the Tobacco Industry under the Agricultural Development Scheme has made favourable progress. Reports indicate that the organisation and regulation of tobacco marketing in combination with advisory, practical and financial assistance to growers have resulted in marked improvement in the volume and quality of the Island's trade in cigar leaf tobacco.

Returns to growers have been reasonable and since the launching of the scheme in 1936, there has been a steady expansion in acreage of tobacco grown.

The 1938-39 crop which is estimated at 250,000 pounds is now in process of reaping.

Preliminary experiments conducted by the Tobacco Expert on the growing and curing of Virginia tobacco are sufficiently encouraging to justify the continuation of the Tobacco Scheme for a further period of three years. The demand for Virginia tobacco is much greater than that for cigar tobacco.

THE MARKETING DIVISION.

The experiment started a little over a year ago in establishing a marketing division of the Department of Agriculture has made such progress as to justify the establishment of a separate Department of Government to deal with marketing problems. Of particular interest and value has been its efforts in the marketing of corn and English potatoes and in the co-ordination of the citrus and coconut industries.

It is hoped to develop the country depots both in size and numbers and to provide a means for the ready marketing of peasant grown crops. Attention will also be given to the better marketing of honey and ginger.

NUTRITION.

Investigations with food crops were commenced under a grant from the Colonial Development Fund. The grant provides funds for the staff and operation of investigational work for a period of three years, subject to the Government continuing to finance the work for a further period of three years.

The two officers appointed under the scheme arrived in the island early in the year. The main object of the investigations is to increase the proportion of protein containing foods in the diet of the peasant classes and to reduce the present preponderance of starchy foods. Much of the vegetable protein of the island is imported in the form of peas, beans and grain. The first step is to enable these foods to be produced locally and to make them more readily available to the people. Local production depends on producing high yields per acre and thereby reducing the unit cost of the food. Higher yields than those at present obtained may be produced by the use of more suitable varieties and of proper methods of cultivation and manuring. The second step is to introduce new protein containing foods which can be grown readily.

With this object in view, a large number of varieties of pulse, cereals and miscellaneous food crops have been introduced. Excellent response from institutions and Departments in the Colonies and other countries has been received and supplies of 376 varieties of seed have been collected. The varieties are being grown at four main centres and eight sub-centres in the Island under widely differing conditions and detailed observations on the behaviour and yield are being kept.

Fertilizer trials on maize and pulse are being conducted and a considerable increase in yield from relatively small applications of fertilizer have been obtained. Some difficulties have been experienced in obtaining suitable land and providing adequate supervision in certain areas distant from Kingston.

The nutritive value of those food crops already present in the Island and those imported has been determined by chemical analysis.

SOIL INVESTIGATIONS.

An area in lower St. Catherine has been surveyed in detail in connection with a proposed extension of the Rio Cobre Irrigation Scheme. Soil samples were obtained throughout the area and their fertility determined. Ecological observations were made simultaneously.

Additional staff in the laboratory has enabled more detailed determinations to be made on the main soil types with a view to determining the most suitable treatment for them and to accounting for their behaviour under certain conditions. Analyses of soil for planters were continued.

Soils and leaf ashes have been examined in relation to coconut wilt.

LIVESTOCK.

1. *General Position.*—The production of livestock ranks third or fourth amongst the principal industries of the Island. Approximately 334,262 acres of grazing lands are devoted to this industry which in its various forms is carried on in all the parishes. St. Ann, Westmoreland, Hanover and St. Elizabeth are, however, pre-eminently the cattle parishes. The rural aspect of the industry, known locally as penkeeping, implies the operation of a fairly large grazing acreage and the keeping of 100 or more head of stock, chiefly cattle. Production on the pens is supplemented to an increasing extent by the operations of smaller land owners and the contribution by thousands of peasants throughout the Island, who on account of their limited acreage, confine their activities mainly to goats (rarely sheep), swine and small flocks of poultry.

While considerable development and progress has been made in this important industry during the last twenty years, in particular, both in breeding policy and field operations, such as the general use of dipping tanks, vaccination against disease, better feeding of dairy cattle and marketing of milk, increased supervision of slaughtering and inspection of meats, there is still room for further improvement in these and several other respects. Such matters as pasture conservation and improvement, storage of fodder for drought periods in the form of hay or silage, growing cereals (maize and millet) for livestock, better utilization of many kinds of naturally produced pods (guango, cashaw) for food, organized marketing and recovery of animal by-products at the larger slaughtering houses are essentials to the welfare and economic stability and success of the industry.

At the Hope Stock Farm the demand for breeding stock, especially bull calves, proved encouraging during 1938, and a healthy public interest has of late been taken in livestock improvement.

Work on the development of a dairy breed of animals suitable for Jamaica conditions continues to make satisfactory progress while attention is being devoted to the problem of economic livestock rations for the tropics. The results of these interesting investigations will not be available for some time yet, but some very useful information has already been accumulated.

Horse and mule breeding has steadily declined since the introduction of motor cars and trucks about twenty years ago, and is now continued as a business on only a small number of pens in the areas best suited for the purpose. The breeding and rearing of donkeys, except for good type jacks for mule-breeding, is not in general controlled or regulated.

Island production of cattle was well maintained during the year and the domestic beef market amply supplied.

Owing to the increasing use of mechanical traction on the plantations and estates the demand for working steers (planter's steers) is decreasing; and in consequence the breeders of this special class of cattle are very generally crossing their herds with beef bulls to improve them for beef. Dairying for market milk is increasing, especially in St. Andrew and St. Catherine for supplying Kingston, and around many of the other coastal towns. The quality of market milk and the methods of handling and delivery have improved greatly in recent years. A healthy rivalry now exists between several progressive dairymen. Butter makers have not been able to stand the competitive pressure of imported butter, chiefly from New

Zealand. Production is now only about one-sixth of what it was six years ago. The proposed establishment of a milk condensary at Bybrook, St. Catherine, in 1940, should stimulate dairying in several parts of the Island and indirectly increase and stabilize prices for beef cattle. There is no tendency to increase sheep production because the market is relatively small and the areas in which these animals can be successfully raised are of limited extent.

The small stock industry of the peasants (goats and swine) continues on much the same lines as in previous years. Goats are being kept in increasing number and find ready sale for mutton. Swine keeping which formerly was exclusively a small cultivator's industry is now being practised on a few banana and coconut plantations, and by the labouring class and others in the vicinity of Kingston and other towns who utilize the refuse from hotels and restaurants mixed with coconut meal for feeding.

Poultry keeping, except for a very few small farms, is in general a housewife's activity throughout the Island. Most of the poultry is produced by small settlers in small flocks. The industry appears capable of much development, if properly organized, because there is a steady local demand for its products.

2. *Animal Health.*—The general health of the livestock of the Island has been good. There have been no outbreaks of acute and highly fatal diseases, except swine fever and sporadic occurrences of blackleg of cattle.

Field observations and reports indicate the need for some co-operative plan for dealing with several prevalent forms of chronic infectious and parasitic diseases which insidiously cause heavy aggregate loss to the industry, both in the field and in the market.

According to reports regular periodic dipping for tick control is not being practised as generally as it should be, consequently ticks are on the increase, and the cattle on pens where this beneficial operation is neglected are backward in growth and poor in condition.

FORESTRY.

During the year under review the Forestry Department was incorporated under the Department of Science and Agriculture and considerable progress has been made in the general organisation of this Branch. The office of the Forest Officer is in close proximity to that of the Agricultural Chemist and close collaboration is maintained between these officers in combating problems such as soil erosion with which both divisions are intimately concerned.

AGRICULTURAL EDUCATION.

The annual staff conference was held in January, 1938, and provided opportunity for valuable discussions on important phases of departmental work. A full account of the proceedings of this conference has been published in bulletin form.

The enrolment at the Government Farm School for the year was 58 students, the highest number since 1929. Keen public interest has been shown in the school both locally and abroad. Enquiries were received from British Honduras, Cuba, Haiti, Nigeria, Canada, the United States of America and Liberia regarding the course offered and the admission requirements.

The value of agricultural training afforded by the Imperial College of Tropical Agriculture located in Trinidad is being more and more realised as our scholars return to the colony and take their place in the work of the Departments of Agriculture and Lands.

The Jamaica Agricultural Society, through its Agricultural Instructors and otherwise, continues to render valuable service to the colony by educating the peasantry and elevating the standard of cultivation of the small farmers. Close collaboration with the Department of Science and Agriculture is maintained, and the establishment of the Instructors' Committee with the Director of Agriculture as ex-officio chairman has materially assisted the development of the desirable degree of co-operation.

A welcome link between the Education Department and the Department of Agriculture has been forged by the entry into the Farm School in 1938 of the first scholars from the Practical Training Centres.

EXHIBITIONS.

Jamaican products figured prominently this year at the British Industries Fair and also at the Glasgow Exhibition. A prominent feature of the exhibits was a display of fruits and vegetables supplied by the Marketing Division of the Department of Agriculture. The considerable interest aroused by our exhibits which included rum, cigar leaf tobacco and cigars, leaves little room for doubt as to the desirability of the Island being regularly represented at exhibitions of this nature.

G. A. JONES,
Director of Agriculture.

SUMMARIES OF DIVISIONAL REPORTS.

Summary of the Report of the Superintendent of Public Gardens and the Horticulturist.

Several orchid seedlings, raised during the period 1930 to 1932 by the asymbiotic method, flowered this year.

New varieties of roses were imported for trial at Hope Gardens.

Hybrid Bougainvilleas were planted out on the lawns adjoining the Tourist Rest House.

The Mango Orchard to the north of the Tourist Rest House was removed to allow for the extension of lawns.

The Band Concerts, given by the Jamaica Military Band, have become a popular feature.

The Public Gardens were satisfactorily maintained.

M. S. GOODMAN
Superintendent of Public Gardens.
E. J. DOWNES,
Horticulturist.

Summary of Report of Superintendent Experiment Station, Hope.

A large number of cuttings of cane varieties was distributed free to estates and cane farmers. A larger number of cuttings of the Mosaic Disease resistant varieties, P.O.J. 2878, M.P.R. 28 and F.C. 916, were distributed as compared with the other more susceptible varieties. The new seedling canes B.3013, B.2935, B.3439 and B.3124, were distributed to estates. Experiments with Nutrition food crops, were continued.

M. S. GOODMAN,
Superintendent, Experiment Station.

Summary of the Report of the Superintendent of Sugar Cane Experiments.

Weather: The rainfall was below the average and canes suffered in some districts, particularly in Trelawny, during the first half of the year. This will affect the crop to be reaped in 1939.

Production: The sugar crop manufactured this year is the largest on record and was approximately 12,000 tons more than last year.

Experiments: Manurial and Cane variety experiments were reaped on a number of estates and the results will be discussed by the Agricultural Chemist in his report. Additional cane variety experiments were laid down with new seedlings.

Yield: The average yield of cane per acre over the Island has been good. Yields of over 60 tons per acre have been commonly obtained.

Varieties: B.H.10/12 still remains the predominant variety and the greater part of the cane areas planted, is in this variety. It is closely followed by P.O.J.2878, which is used in the Mosaic Disease areas. E.K. 28 continues to give good results in two cane areas. B. 726, although fairly good as a plant cane, is a failure as ratoons.

Cane Farming: Cane Farmers have become prominent in the production of cane for the factories and their number continue to increase yearly.

Factories: The erection of a Central Factory at Frome, Westmoreland, by the West Indies Sugar Company with a capacity of some 30,000 tons of sugar, will be completed in time to take off the 1939 crop.

Visits: Dr. A. E. S. McIntosh, Ph.D., B.Sc., Geneticist of the Central Cane Breeding Station, Barbados, paid a visit to the Island and was taken to the various cane districts.

M. S. GOODMAN,
Superintendent of Sugar Cane Experiments.

Summary of Report of the Headmaster of the Government Farm School for the year ending December 31st, 1938.

The total enrollment of students at the school during the year was 59, the highest since 1929, and 14 students received Diplomas in Practical Agriculture at the Graduation in July.

The demand for Farm School Graduates showed considerable improvement and more students were placed than for some years previous. The number of students out of employment is small compared to former years.

The Third Year Students spent half of each term at Grove Place. Accommodation for 22 students at Grove Place is now available, which makes it possible to send the whole of the Third Year Class there instead of dividing it into two as was necessary in the past when more than 14 students were in the Third Year.

The number of visitors to the Farm School showed a considerable increase over the previous year, and more parties of school children and members of the branches of the Jamaica Agricultural Society visited the Institution than during the previous year.

G. B. Grant, a Third Year Student, made an outstanding record when he represented Jamaica at the Pan-American Olympic Games at Panama, where he won all events in which he entered.

J. W. HOWE,
Headmaster.

Summary of the Annual Report of the Farm Superintendent for the year ending December 31st, 1938.

The low rainfall during the year made the feeding of a large herd difficult, and there was an acute shortage of pasture during certain periods of the year.

The dairy herd was the largest since the beginning of the Farm, and total production showed an increase over the previous year of over 31,000 quarts. The requisitions for milk from the Public Institutions were the highest on record and despite the fact that the herd was larger than in previous years at times it was not possible to supply the demand for milk.

There was a keen demand for calves for breeding purposes and 43 head were sold. There was also a good demand for poultry during the year and more breeding stock was sold than during 1937.

The health of the stock during the year was good.

The feed situation is one which is giving some concern, especially as the rainfall during the year was less than in former years and was unevenly distributed. If it is necessary to keep such a large herd at Hope, irrigation will have to be provided in order to insure that pasture is available at all times of the year.

The number of visitors to the Farm increased.

The demand for dairy stock still continues brisk and orders for bull calves are large with a long waiting list for all breeds.

J. W. HOWE,
Farm Superintendent.

Summary of Report of Superintendent Grove Place Stud Farm and Experiment Station.

1. *Weather.*—The rainfall for the year was very much below the average for the previous six years and a shortage of water was experienced during the early part of the year.

2. *Experiment Station.*—In addition to the maintenance of the established major crops, manurial experiments with potatoes were conducted, and trials of fodder and cover crops continued with most encouraging results.

A large number of the grapefruit trees at the manurial experiment plot came into bearing, and were allowed to mature fruits which were gathered and tested in accordance with the objects of the experiments.

The cultivation of a small plot of tobacco (Virginia variety) was undertaken, and on curing, a very good sample was obtained.

The survey for the control of fiddler beetle and slug was continued with success.

3. *Livestock.*—The policy of grading up the cattle along definite lines, and of making rigid selection, continues, while the projects in connection with the dairy cows and heifers are progressing with very encouraging results.

We continue to find a ready market at the Mental Hospital for the butter made.

All animals kept good health, and stud services for horsekind and pigs received marked increased patronage. A large number of purebred pigs were distributed during the year.

4. *Agricultural Education.*—Senior students of the Farm School attended for the usual course of instruction in Practical Agriculture—the course extending over two periods of eleven and five weeks respectively.

Several demonstration days for members of Branch Societies and School Associations were observed, and three lectures given at agricultural meetings.

5. *Buildings and Equipment.*—Several additions and improvements were effected during the year, including a two-storey building, comprising a dormitory and recreation hall for the students—an addition of three apartments to the stock manager's quarters and the construction of two tanks for the improvement of the water supply for stock and domestic purposes.

L. A. POWELL,
Acting Agricultural Superintendent.

Summary of Senior Veterinary Officer's Report.

1. *Livestock production* is third or fourth of the principal industries of the Island. While the main source of supply is the large pens with a grazing acreage of approximately 334,262 acres, the aggregate contribution by small settlers is considerable.

Although much progress has been made in the last twenty years in breeding policy and many field practices, also in the production and marketing of milk and the slaughtering and sale of meat, there is increasing need for pasture improvement, storage of food for drought periods, organized marketing and utilization of animal by-products at slaughter houses.

Horse and mule breeding continues to decline because of mechanized transport and tillage. Production of cattle for beef is increasing because the demand for draft cattle is decreasing. Dairying for market milk is increasing, but butter making is rapidly declining.

Small stock and poultry, formerly raised almost exclusively in the country parts, is becoming also a suburban occupation, especially swine on garbage feeding.

2. The general health of the livestock has been good. There have been no extensive outbreaks of acute diseases, except swine fever and sporadic outbreaks of blackleg. Some of the chronic infectious and parasitic diseases need attention because of the aggregate loss they entail, and tick control requires sustained Government supervision.

3. The Department's contribution to animal husbandry consists mainly of its activities at Stock Farm at Hope, Stud Farm at Grove Place, by District Stud bulls, and the field services of the staff.

4. Marketing of livestock and their products has not yet been developed departmentally.

5. *Disease control*—

(i) All reports of suspected anthrax and foot-and-mouth disease when investigated proved false. Preventive vaccination against anthrax was conducted departmentally on six pens and in two large small settlers' districts having a previous history of anthrax infection, and is encouraged and assisted as an annual practice in known infected areas.

(ii) Blackleg of cattle is frequent in moist hilly areas, but comparatively infrequent around the coast. Vaccination for its control is a general practice on the large pens. The Department and Jamaica Agricultural Society assist in these measures both on pens and among the small settlers.

(iii) Swine fever continued around Kingston and lower St. Andrew until April, largely because of the manner in which pigs are kept and the lack of co-operation by owners. Additional outbreaks were established at Golden Grove, St. Andrew; Old Harbour Bay, St. Catherine; Johnston District, St. Thomas; and Annotto Bay and dealt with. Other reports of this disease investigated in districts of St. Andrew, Clarendon, Westmoreland and St. Thomas were negative for swine fever. Garbage feeding is increasingly practised and will become a menace to the industry, unless the serum-virus method of immunization is generally adopted and the pigs are properly confined. The problem is a difficult one among inexperienced breeders and feeders.

(iv) Sporadic outbreaks of tick fevers were dealt with on seven pens, arsenic poisoning of stock on three pens and general joint-ill infection of calves on two pens.

(v) *Urechites sub-erecta* (Jamaica nightshade) as a poisonous plant is becoming an increasing source of loss of livestock.

6. Veterinary assistance in the Public Works Department was given at eight of its depots and in the purchase of horses and mules in July.

7. *Government Stock Farm at Hope.*

In spite of tuberculin testing and improvement in sanitation, tuberculosis of variable (at present low) incidence still exists. The incidence of infectious abortion and its sequel of sterility, although about the same

as in the past, is a serious problem and difficult of solution except by very radical means. Segregation on the basis of serum-agglutination tests is not practical and calf vaccination as a policy of control seems the only solution. Congenital weakness and gastro-intestinal disorders are the chief troubles among the pail-reared calves. Figures suggest strongly that it would be advisable to reduce the number of cow calves reared annually at Hope by selling a portion of the crop to the public shortly after birth as is done with the bull calves.

The two chief diseases of the poultry are sub-acute cholera and contagious epithelioma.

8. *Grove Place Stud Farm.*—

The general health of the livestock was good throughout the year. Vaccination against anthrax and blackleg was carried out. Psoroptic mange of horses and mules is under better control and tick infestation has been reduced; but the farm will always be subject to re-infection by admission of outside animals to the stud in spite of warnings to clients and the precautions employed.

9. *Veterinary Education.*—

- (i) Teaching of Veterinary Science in the Farm School.
- (ii) Participation in Staff Conference.
- (iii) Lectures and demonstrations at Shows and local meetings of Jamaica Agricultural Society.
- (iv) Field demonstrations in diagnosis of infectious diseases, etc.

10. *Statistical Information covers:*—

- (a) The number of various kinds of livestock in the Island and the number of grazing pens and acreage.
- (b) Domestic meat supply.
- (c) Domestic supply of milk and butter.
- (d) Exports of hides and skins.
- (e) Exports and imports of livestock including poultry.
- (f) Registered dipping tanks and sales of Paranaph and Arsenite of Soda for their operation.
- (g) Status of slaughter houses in the Island.

11. *Foul Brood Disease of Bees.*—

Government supervision of the area of Kingston and St. Andrew (the declared infected area since November, 1934) was maintained throughout the year. Only one case of recurrent infection was found, which indicates that the control measures (outlined in the report) enforced during the three previous years, have been eminently effective in stamping out the disease.

(ii) A table showing the number of apiarists, apiaries and colonies in Kingston and St. Andrew and other parishes is given with an explanation that the figures are subject to constant change and in many cases are only an approximation, especially for the parishes other than Kingston and St. Andrew.

S. LOCKETT,
Senior Veterinary Officer.

Summary of Report of Forest Officer.

- 1. The Forest Law (No. 42 of 1937) was put into force.
- 2. Rules regulating the transit of timber and the registration of property marks were passed.
- 3. Twenty-eight Forest Officers were appointed under the Forest Law.
- 4. Eighteen Forest Reserves, totalling 197,636 acres were provisionally gazetted.
- 5. Water Commission lands and 307 acres of War Department lands were taken over for Forest Reservation.
- 6. Over 83 miles of reserve boundary were demarcated.
- 7. Seventeen properties, totalling 2,412 acres, were purchased for Forest Reservation.
- 8. Surveys of 49 miles of boundary line were carried out.
- 9. Bridle roads and patrol huts were built and maintained.
- 10. Fifty-six forest offences were reported and dealt with.
- 11. Ninety-six acres of denuded land were re-afforested.
- 12. The Crown Lands Forest Produce Rules were approved and put into force.
- 13. One hundred and eight licences were issued, and 59,000 cu. ft. of timber was cut from Crown Lands.
- 14. The supply of sleepers to the Jamaica Government Railway was investigated.
- 15. A seasoning shed and workshop for research on native timbers was built.
- 16. The expenditure of the Branch was £6,239 (of which £2,039 was special non-recurrent) and the revenue £713.

C. SWABEY,
Forest Officer.

Summary of the Report of the Agricultural Officer.

The specific duties of the Officer consisted as before of citrus extension work. Distribution of plants from nurseries again started and a further extension of the Prison Farm nursery of two acres was completed in time to be ready for budding in the Spring of 1939.

Fruit is now appearing in most of the older groves. Two boxes of fruit per tree average in one grove and four to five boxes from individual trees are interesting records for young groves. Valencia oranges are fruiting nicely in heavy soils and colouring attractively in the hills.

Interest displayed by growers in St. Ann has been a distinctive feature. One planter in particular displaying much keenness and completing a fairly large planting with little loss, while others are also doing their part. St. Catherine has taken the lead in the quantity of plants taken, new planters being responsible for over 5,000 plants while former planters appropriated approximately 50% of that figure.

Interplanting with catch crops has proved itself beneficial to rapid development due to intercultivation of the land and to a certain amount of protection from wind.

The demonstration plots still serve a useful purpose, except the one in Portland which was destroyed by flood and not restored.

The Citrus Development Loan Scheme is responsible this year for 118 additional acres being planted with a total of 368 acres the oldest groves being 3 years old and now fruiting.

Distribution of citrus plants in St. Catherine totalled 9,241 (Experimental or Demonstration Plots using 1,407); St. Ann, 4,233; Clarendon, 4,119; and Manchester, 3,494. Valencia orange is the type for which there has been the greatest demand.

L. L. CARRINGTON,
Agricultural Officer.

Summary of Report of the Tobacco Specialist.

Experimental Plots.—From the three experimental plots of 2 acres each 4,352 lbs. gross weight of tobacco were produced. The plots at Hope and Constant Spring were good, but the plot at Temple Hall suffered from too much rain. Three types of Puerto Rican, two Havana, one Manilla and one Sumatra type were tried out. The Havana and Sumatra types proved to be the best. Nine small plots in different districts were planted out with Virginia tobacco and some good bright leaf was produced by the flue-curing process. Samples of these were well commented upon in England.

From the manurial tests the 5.10.10 and 8.20.24 mixtures were the best, both for growth and texture, and the burning qualities were far better in all leaf manured with the above fertilizers.

2. *Development Scheme, 1937.*—148,032 lbs. nett weight of tobacco were delivered at the Tobacco Grading Station from 91 growers, of whom 37 were registered growers. £4,129 was advanced to those who signed either contracts or agreements to help them build barns and cultivate and after the first prices had been paid out a debt of £1,126 was still due. Most growers again had trouble with their nurseries.

3. *Development Scheme, 1938.*—There were 39 registered growers for crop 1938, and five growers who signed agreements to deliver their crops to the Station. These growers have planted 378 acres for which a sum of £5,930 has been set aside as advances to help them with their cultivation and harvesting and also to help those in need of barns. The crop at Woodleigh and York Pen will be good, but through lack of rain, Lucky Valley and Colbeck will suffer.

4. *Independent Growers and Exporters.*—These have now learnt very well how to grade and put up their tobacco, which makes examination easier. The moisture content is always too high in all tobacco sent here for export. From the 1936 crop 21,612 lbs. and from the 1937 crop 34,479 lbs were exported by these independent exporters to the United Kingdom, and 504 lbs. were shipped to Bermuda. All this tobacco was examined at the Tobacco Station.

5. *Government Tobacco Station.*—The Station was enlarged by one building of 100 ft. by 30 ft., and the existing grading shed was improved. 164,704 lbs. gross weight of tobacco was handled during the year, and a larger number of women were employed than formerly. The average number of women employed per day over the working period of nine months was 106. The number of grades was cut down to seven, and most short lengths were stripped. All wages were increased in June, which considerably increased the working costs. Through representations from the buyers that the moisture content was more than it should be, the tobacco was dried out more quickly by airing it before packing during the dry months. This certainly brought the moisture content down to what was desired, but did not improve the flavour or aroma of the leaf, which really should be kept for a period of at least 9 months to age and dry out naturally. The average price paid out to growers on delivery was just under 8d. per lb.

6. *Visit to United Kingdom.*—Various samples of Creole leaf, Virginia and Cigar leaf were taken by the Tobacco Specialist to England in August to interest tobacco manufacturers and importers. The creole samples were not received with favour, as this type was thought too non-descript in character, but the Virginia samples caused some surprise and it was thought that a market would be found for this type, if improved. The cigar types were already known on the market, and it was remarked that since Government supervision a great improvement had been made. Samples of tobacco scrap, midribs and stalks were sent to the Imperial Institute for examination and testing for nicotine content, but as this was so small it was considered not suitable for export. As there seems to be a future for Jamaican grown Virginia, several samples of some of the best types from Canada, America, Rhodesia and India were brought back here for Virginia growers to examine.

7. *Miscellaneous.*—Many enquiries were received regarding tobacco production and correspondence was considerable. Circulars were sent out to all who asked for them. Fewer visitors came to see the Experimental nurseries this year.

J. W. WINCKLEY,
Tobacco Specialist.
30.1.39.

Summary of Report of Chief Inspector of Produce.

1. During the year under review the Citrus Regulations were revised and limes included in the schedule. Provisions whereby a certificate of Inspection is required for exports have had satisfactory results.

2. Owing to reductions in the cost of licences and to the policy of Banana Companies to discontinue purchase of fruit in the country parts there has been a distinct falling off in revenue from licenses.

3. (a) *Bananas.*—Owing to rigid inspection on the part of Inspectors and Shipping Companies the quality of bananas exported has improved.

(b) *Citrus.*—The volume of citrus exports has improved but the demand for grapefruit has been limited. Our New Zealand shipments have been satisfactory and the quota allowed us for that market has been increased.

(c) *Minor fruits.*—The quality of our shipments of minor produce has also improved and reports from brokers in the English market have been satisfactory.

4. Rejections of produce by this division though not extensive show an increase over the figures for the former year and there was an increase in the total number of court cases.

5. The Produce Board continues to operate satisfactorily.

P. W. MURRAY,
Chief Inspector of Produce.

Summary of Report of the Deputy Island Chemist.

The total number of samples analysed in the Government Laboratory for the year ended 31st December, 1938, was derived as shown in the following table:—

(I) Police and Judicial Departments	..	3,101	60 per cent.
(II) Customs and Excise Department	..	263	5 do.
(III) Department of Science and Agriculture	..	22	
(IV) Medical Department	..	17	
(V) Department of Public Works	..	92	=383 or 7 do.
(VI) Railway Department	..	1	
(VII) Post Office Department	..	4	
(VIII) Jamaica Agricultural Society	..	200	
(IX) Kingston and St. Andrew Corporation	..	2	
Total Official Samples		3,702	
Government Stock Farm (milks)	..	1,152	22 do.
General Samples:—			
Sugars	..	29	
Rums	..	55	
Cattle Dipping Fluids	..	66	
Waters Potable and Boiler Feed	..	20	
Waters Irrigation	..	24	
Essential Oils	..	10	
Food Products	..	15	
Ores and Minerals	..	11	
Animal Viscera for poison	..	4	
Horse swabs for suspected dope	22	256	
Miscellaneous	..	38	294 6 do.
Grand Total	..	5,148	100 do.

The number of Official Exhibits examined and analysed under various headings and Laws were as follows:

(I) Police and Judicial Departments:—			
Human Viscera and organs for Poison	..	..	201
Stomach Washings (5), Vomits (14), Urines (4)	..	..	23
Animal Viscera for Poison	..	..	4
Substances and Articles suspected to contain Poison	..	..	190
Exhibits in Murder and Shooting Cases	..	..	56
Do. Obeah Cases	..	..	29
Do. Housebreaking and Larceny Cases	..	..	4
Do. Arson Cases	..	..	2
Do. Robbery with violence cases	..	..	2
Do. Receiving money by False Pretences cases	..	..	58
Do. Destruction of Property	..	..	12
Do. River Pollution cases	..	..	5
Do. Maiming with Acid cases	..	..	2
Do. Sending Threatening Letters	..	..	3
Under the following Laws:			
Food and Drugs Law—Wines	..	..	7
Sale of Drugs and Poisons Law—Drugs, etc.	..	..	2
Medical Laws—Medicines, Drugs, Herbs, etc.	..	..	325
Dangerous Drugs Law—Opiums, Ganga, and various exhibits	..	..	919
Coining Laws—Genuine and Counterfeit coins and coining exhibits	..	..	952
Spirit License and Rum Duty Laws—Rums, Whisky, Gin and other suspected liquids	..	..	303
Petroleum and Fuel Oil Laws—Kerosenes	..	..	1
Miscellaneous Exhibits—Minerals (Iron Pyrites)	..	..	1
			3,101
(II) Customs and Excise Department:—			
Rum Punches 33, Native Liquors 27	..	..	60
Native Wines 33, Gins 2	..	..	35
Flavouring Extracts and Essences	..	..	14
Medicated Wines, Drugs, etc.	..	..	10
Insecticides, Disinfectants and Wood Preservatives	..	..	18
Fuel Oils 62, Lubricating Oils 3	..	..	65
Denatured Alcohols 5, Bay Rums 1	..	..	6
Fabrics, Silks, Artificial Silks, Cottons, etc.	..	..	30
Turpentines 2, Kerosene Oils 1, Brake Fluids 1	..	..	4
Condensed Milks	..	..	4
Miscellaneous	..	..	17
			263

(III) Department of Science and Agriculture—					
Animal Viscera for Poison	..	..	..	..	3
Substances for Poison	..	..	..	..	1
Insecticides and Disinfectants	..	..	..	..	3
Brines, Waters, Food Products	..	..	..	..	4
Instruments for test	..	..	..	..	1
Fresh Milks 9, and Water 1	..	..	..	..	10
					22
(IV) Medical Department—					
Fresh Milks genuine	..	..	..	..	6
Do. adulterated	..	..	..	..	3
Waters, Potable	..	..	..	..	2
Mackerel, Pickles	..	..	..	..	1
Medicines 2, Soaps 2, Disinfectants 1	..	..	..	..	5
					17
(V) Department of Public Works—					
Native Corns	..	..	..	..	87
Waters, Potable 2, Irrigation 2	..	..	..	..	4
Lighthouse Oils	..	..	..	..	1
					92
(VI) Jamaica Government Railway—					
Waters	..	..	..	..	1
(VII) Postal Department—					
Documents (envelopes, etc.)	..	..	..	..	4
(VIII) Jamaica Agricultural Society—					
Cassava Tubers (Trial Plots)	..	..	..	..	200
(IX) Kingston and St. Andrew Corporation—					
Gas Coals 1, Spent Oxides 1	..	..	..	..	2
Amount collected for Laboratory Fees	..	..	£157	1	3
Amount collected for Laboratory Sales	..	..	1,018	3	3
Letters, orders, etc., dealt with exclusive of personal and cash orders,	..	..	..	..	2,460
Laboratory Staff—					
Deputy Island Chemist	..	..	..	..	1
Assistant to the Deputy Island Chemist	..	..	..	..	1
Senior Technical Assistant	..	..	..	..	1
Junior Technical Assistants	..	..	..	..	2
Clerk and Storekeeper	..	..	..	..	1
Typist and Stenographer	..	..	..	..	1
Storeman and Boiler Attendant	..	..	..	..	1
Messengers, Male 1, Female 1	..	..	..	..	2

Fees amounting to £157 1s. 3d. were paid into the Treasury, mostly in respect of the 294 General Samples submitted by the public, and as these only represent 6 per cent. of the work done by the Laboratory, on sample basis, it is evident that 94 per cent. of the work was done free for Government Departments.

W. L. BARNETT,
Deputy Island Chemist.

Summary of Report of Entomologist.

Insect pests which have come under observation have been recorded under the crops or materials attacked.

A severe outbreak of the brown weevil, *Metamasius sericeus* Oliv., occurred over an extensive area in St. Catherine and to a lesser extent in a few sugar cane fields in St. Thomas. Infestation occurred in fields where a large number of stalks had been damaged by rats. The pest was rapidly brought under control by the adoption of sanitary measures. An informative paper on the subject was published in the quarterly Journal of the Jamaica Association of Sugar Technologists, Vol. 1, No. 4.

During the early part of the year a survey was undertaken to ascertain the prevalence of White Grubs in sugar cane fields. The chief species concerned was found to be *Lachnosterna jamaicensis*, Arrow., the adults of which are locally known as June Beetles.

Bananas have not suffered to a noticeable extent from insect pests though scale insects have been found in increasing numbers attacking plants which had been sprayed for Leaf Spot. Further consignments of the predators of the banana borer, *Plaesus javanus*, Er. from Fiji, and *Dactylosternum hydrophiloides*, McL. and *D. abdominale*, L. from the Federated Malay States have been received and liberated in St. James and St. Mary. A small number of larvae from the first shipment of each species which arrived here in 1937, have been recovered in the field.

Outbreaks of the Citrus pest *Prepodes vittatus* (L.) occurred in St. Thomas, Trelawny, and St. Mary. Planters were encouraged to effect control by systematic collection of adults and egg batches, as this method has proved both effective and economical at the Grove Place Experiment Station.

Pests attacking minor crops, tobacco, mango and stored products have been recorded.

The teaching of applied entomology has been pursued by means of regular contributions to the Journal of the Jamaica Agricultural Society, and by lectures delivered at meetings of agriculturists.

Experiments have been carried out to test various chemicals and wood preservatives in connection with termite control and prevention of wood rot, and with insecticides and weed-killers in an effort to devise a means of controlling various insect pests which infest lawns and sodium arsenite has proved most effective.

With reference to the economic problem presented by termites, emphasis is laid on the necessity for the fullest collaboration between the Entomological Division and the Central Housing Authority in charge of Schemes for Slum Clearance and re-housing. It is strongly felt that failure to take timely and adequate precautionary measures in the erection and construction of buildings, constitutes one of the major factors contributing to their rapid deterioration and consequent reversion to slum standards.

W. H. EDWARDS,
Entomologist.

Summary of Report of the Agricultural Chemist.

SOIL INVESTIGATIONS.

1. *Rio Cobre Irrigation Extension*.—An area of about 12 square miles has been surveyed in detail with a view to determining its suitability for irrigation.

2. *Estimation of Exchangeable Bases*.—Determinations have been made of the distribution of exchangeable bases in the major soil types.

3. *Organic Matter*.—Investigation of the rate of decomposition of organic matter in certain soil types have been commenced.

4. *Soils from experimental areas have been examined*.—Certain areas in lower Clarendon have been sampled. Soils producing vegetables of poor quality have been studied.

GENERAL AGRICULTURAL ANALYSIS.

1. A summary of the samples analysed in this laboratory is given. The difficulty of mixing and sampling artificial manures is stressed.

FOOD CROP INVESTIGATION.

1. A brief summary of the object of the investigation is given.

2. The progress in the work at various centres is recorded.

3. Results of fertilizer and spacing trials with maize, groundnuts and rice are summarised.

4. A list of seeds imported is given.

5. Comparative analyses of similar pulse crops grown in different sections of the Island, and of different pulse grown under similar conditions are recorded.

6. The effect of fertilizer treatment on the composition of maize is investigated.

7. The results of the analysis of diseased and healthy cow peas are recorded.

SUGAR CANE.

1. The major results of the annual Cane Yield Survey for 1937-38 are recorded.

2. The sugar factory performances for four years are summarised.

3. The activities of the Sugar Advisory Committee, the Jamaican Association of Sugar Technologists and the Sugar Control Board are briefly recorded.

4. A list is included of the manurial and fertilizer experiments with sugar cane now in progress.

BANANAS.

1. A summary of the results from the first stage of the fertilizer experiments is given.

2. The work in progress on the analyses of banana ashes is indicated.

CITRUS.

The progress in the citrus manurial experiment at Grove Place is noted.

H. H. CROUCHER,
Agricultural Chemist.

Summary of Report of Government Botanist.

The Botanist was absent from the Island on leave from January 1st to March 22nd, and acted as Government Entomologist from October 29th to the end of the year.

A number of enquiries of a purely botanical nature, particularly in relation to weeds, have been dealt with.

BANANA BREEDING.

Weather during the year proved favourable for this work and losses of pollinated fruit were less than in previous years. The year has been one of further expansion, 3,397 stems were pollinated and 2,374 seed yielded. 516 seed germinated and 312 seedlings were established in the field, an increase of 84.6% over last year. Considerable extensions to existing breeding plots have been made, two new plots came into operation and four more plots have been laid down for use in 1939. Work on the various plots is briefly reviewed.

No important modification of the types of cross carried out in previous years has been made; one new wild parent, *Pisan Lilan*, has been brought into use. Certain crosses, in particular backcrosses, which have proved consistently infertile over a number of years have been discontinued. The *Highgate* variety is being crossed with the various immune diploids and continues to give the more promising seedlings. F2 families are being increased in size as rapidly as possible.

Seed of 32 wild *Musae* has been received from various parts of the world, many have germinated and will be tested as possible new parents for breeding.

NEW SEEDLINGS.

312 new seedlings have been established in the field and 306 remain to be planted out. 16 seedlings have been selected for more extensive trials and their characteristics are summarised. With few exceptions they continue to suffer from the defect of short fingers as compared with *Gros Michel*. 1936 and 1937 selections are still in process of multiplication.

Extensions have been made to plots in which seedlings are tested for resistance to Panama Disease, a further 166 seedlings have been included in these trials. Of the 158 seedlings under test for seven months or more 14 only have gone down with Panama Disease.

CYTOLOGY.

Somatic chromosome counts of seedlings have been resumed and new counts are summarised. They fully confirm previous findings and conclusions.

PAPAW.

Fruit from varieties of *Carica papaya* crossed with species resistant to papaw mosaic disease have been reaped but no fertile seed was obtained. These crosses have been resumed on a more extensive scale. One more species, *C. candicans*, was imported but failed to survive.

INSECT PESTS.

A resumé of the activities of the Entomological division, whilst the Botanist was in charge, is given. Most of the work was of an advisory nature; the pests dealt with and other enquiries are listed.

Importation of predators of the banana borer (*Cosmopolites sordidus* Germat), have been made and the insects liberated in suitable areas. Mention is made of other investigational work in progress.

L. N. H. LARTER,
Government Botanist.
31.1.39.

SECTION II.—WORK OF THE DEPARTMENT OF AGRICULTURE.

A. PUBLIC GARDENS.

(i) Report of the Superintendent and the Horticulturist.

1. HOPE GARDENS.

Weather.—The rainfall for the year was 40.56 inches which is below the average for the past 57 years. During the months of August and September, approximately half of the year's rainfall was deposited. There was no damage from heavy rains.

Orchids.—The collection of *Calanthes* which has been brought together during the past four years, provided an attractive floral feature in the Orchid House during the months of November and December. *Calanthes* grow very successfully at Hope and their time of flowering makes them popular as decorative flowering plants during the tourist season.

Orchid seedlings.—Satisfactory growth has been maintained among the seedling orchids. The plants raised by crossing *Cattleya Dowiana* x *Cattleya Hardyana* var *regalis*, produced a profusion of blooms during May and June. In the seedlings were many shades of colouring—including white, cream, purple and gold.

The main collection of orchids provided a regular supply of flowering plants for display in the Orchid House throughout the year. Contributions of various orchid species were received from private growers in the Island.

Rose Garden.—Very satisfactory results have been obtained from the varieties of Roses grown in the new beds, which were prepared during the previous year, when the Rose Garden was remodelled. New varieties were purchased from Good and Reese, Springfield, Ohio, for trial at Hope.

Bougainvilleas.—Two beds, 12 feet in diameter, were laid out in the lawns adjoining the Tourist Rest House, to accommodate a selection of hybrid Bougainvilleas, which have been raised in the Gardens during the past 10 years. The beds were dug out to a depth of 3 feet and refilled with selected earth, decayed humus and manure. The hybrid Bougainvilleas selected for these beds were B. Evelyn Jelf (*Rosa Catalina* x B. *Spectabilis* var. *lateritia*), B. Mrs. Butt and B. Lady Wilson (*Rosa Catalina* x B. *spectabilis* var. *lateritia*).

A triangular bed to the north of the Band Stand was also prepared with new soil and planted with the hybrid Bougainvillea, Lady Stubbs (*Rosa Catalina* x B. *spectabilis*).

Removal of Mango Trees.—The orchard of Mango trees to the north of the Tourist Rest House was cleared of the trees to allow for the extension of the ornamental section of the Gardens. By removing the trees, it has also added considerably to the Garden landscape by opening a view to the hills.

Plumbago capensis.—Eight small beds at regular distances were prepared on each side of the pathway leading to the Tourist Rest House, and planted with *Plumbago*.

Gerbera Jamesonii.—A collection of *Gerbera Jamesonii* in many shades of colour has been established from seed kindly presented to the Gardens by Mr. C. E. Englemann, Saffron Walden, England. A number of plants of the rare double varieties is included in the collection.

Bulb Garden.—The collection of *Hippeastrums* has been removed from the site adjoining the aviary and replanted in a plot of land near to the Oleander shrubbery. In laying out the new bulb garden, the opportunity has been taken to provide more space to grow a varied collection of bulbous plants.

Water Lilies.—A collection of tropical day blooming water lilies was purchased from the Independence Nurseries, Ohio, U.S.A., for the new water lily tank.

Ornamental Plants.—A collection of tropical plants, new to the Island, was purchased from Mr. L. R. Russell, Richmond Nurseries, England.

Talipot Palms.—Five Talipot Palms (*Corypha Umbraculifera*) flowered during the year.

Aviary.—A more finished appearance has been given to the site of the Aviary by laying down grass turf in the inter-sections on which the cages stand. The grass is kept green by daily watering during the dry season, thus providing a regular cool atmosphere for the birds. Mr. C. A. Williams presented eight Mexican Budgerigars for the Aviary. They are increasing rapidly and within a short period they should be one of the chief attractions of the Aviary.

New Water Lily Tank.—A concrete tank, 30' x 12', was built at the west end of the Sunken Garden to accommodate a collection of tropical water lilies.

Gardeners' Luncheon Room.—A section of the Nursery building was enclosed to provide accommodation for the Gardeners to have their meals. The room is equipped with a table and benches.

Buildings.—Two modern public lavatories were erected near the Plant Houses. The buildings were erected by Messrs. Mais and Sant under the direction of the Public Works Department.

Floral Exhibitions.—The Public Gardens staged a non-competitive group of cut flowers at the Jamaica Horticultural Society's Flower Show which was held at the Mico Training College on April 13th, 1938. The exhibit covered a frontage of 40 feet and was chiefly composed of annuals.

Band Concerts.—Regular concerts were arranged by the Jamaica Military Band on the 1st and 3rd Sundays of each month. The Kingston and St. Andrew Band played in Hope Gardens on Sunday, October 23rd.

Nursery.—A large number of seedlings of various hard-wood trees were raised in the Nursery for the Forest Department for its re-afforestation activities.

The plants distributed from Hope Gardens in 1938.

Sold.

Economic Plants—

Coffee	1,200
Citrus seedlings	9,611
Citrus Budded Plants	344
Mango Grafted Plants	269
Miscellaneous	1,704

13,128

Ornamental Plants 17,302

30,430

Free Grants.

Economic Plants—

Grafted Bombay Plants	1
Citrus Seedlings	15
Citrus Budded Plants	30
Cane tops and cuttings	195,782
Timber Trees	646
Guatemala Grass cuttings	2,400
Miscellaneous	93

198,967

Ornamental Plants 7,190

206,157

Total number of Economic Plants 212,095

Total number of Ornamental Plants 24,492

Total number of plants distributed 236,587

The following statement shows the distribution of plants for the past five years from the Nursery at Hope:—

Plants.	1938.	1937.	1936.	1935.	1934.	Total.
Coffee	1,200	15,350	11,991	19,192	12,116	59,849
Cacao	..	150	50	..	..	200
Citrus seedlings	9,626	5,925	9,800	4,177	1,603	31,131
Citrus, Budded plants	374	602	301	282	1,256	2,815
Mango, grafted plants	270	191	656	336	975	2,428
Cane tops and cuttings	195,782	166,740	139,228	141,880	163,785	807,415
Elephant Grass cuttings	..	..	..	..	600	600
Guatemala Grass cuttings	2,400	21,461	..	..	..	23,861
Timber seedlings	646	3,842	11,957	9,605	3,341	29,391
Miscellaneous fruit and	..	..	..	..	..	..
Economic plants	1,797	1,485	2,153	2,378	3,239	11,052
Ornamental plants	24,492	15,825	22,157	27,693	26,867	117,034
	236,587	231,571	198,293	205,543	213,782	1,085,776

2. CASTLETON GARDENS.

Weather.—The rainfall for the year was 145.59 inches. During the months of May and September, there were deposits of 21.97 inches and 26.24 inches respectively. During these months, the gravel pathways through the Gardens were badly scoured and gravel had to be headed from the river to resurface them.

New Introductions.—Two plants of the *Pigafettia elata* palm, which were sent us from the Coconut Grove Palmetum, Florida, were planted out in the Palmetum at Castleton. The palm is a native of the Mollucas. *Gardenia Citrodora* and *Gardenia Commendatore var Stringer* which are new introductions have been planted out in the Upper Garden.

Routine.—The general routine work of billing lawns, clearing flood drains, repairing pathways, pruning, forking, weeding shrubberies, and propagating plants, for nursery sale, was regularly attended to.

Plants distributed from Castleton Gardens in 1938.

Sold.

Economic Plants	..	..	..	114
Ornamental Plants	..	..	..	944
				1,058

Transferred to Hope.

Economic Plants	..	..	..	1,041
Ornamental Plants	..	..	..	6,345
				7,386
Total number of Economic Plants	..	..	..	1,155
Total number of Ornamental Plants	..	..	..	7,289
				8,444

3. PUBLIC GARDENS, KINGSTON.

The general routine work of maintaining the Victoria Park, for example, renewing the Canna beds with manure and decayed vegetable matter and replanting the beds, daily watering of the Cannas, mowing lawns and clearing quantities of refuse left in the Park by visitors, watering and mowing the lawns around the Public Buildings, the memorial square and Headquarters House gardens, was regularly attended to.

4. HILL GARDENS, CINCHONA.

The Horticulturist visited the Hill Gardens and remained in residence for one week. The time was occupied by him in inspecting the Gardens and adjoining woodlands. A general clearance of undergrowth from the shrubberies was undertaken and the layout of the plant rockeries in the Glass House was redesigned under the guidance of the Horticulturist.

Buildings.—The Superintendent's house, which had been neglected for repairs over a number of years, was taken over by the Forest Department and made habitable for the use of the Officers of the Forest Department whilst engaged in work in the Blue Mountain district. The Public Works Department carried through the necessary repairs to the Director's house.

Xmas Trees.—A number of Pine Trees, (*Pinus Massoniana*), and Fir Trees, (*Juniperus Bermudiana*), were supplied from the Cinchona woodlands to the Public Hospitals and other institutions for Xmas Trees.

Routine work.—The routine work of mowing lawns, weeding and forking borders, repairing and weeding pathways, and repairing fences, was regularly attended to by the Foreman in charge.

5. KING'S HOUSE GARDENS AND GROUNDS.

A number of *Tecoma spectabilis* plants were set out in the Water Garden, to replace some old unsightly trees.

A non-competitive exhibit of Cut Flowers was sent to the Jamaica Horticultural Society's Flower Show, held at the Mico Training College on April 13th.

Buildings.—A house for the Foreman of the Gardens, was erected near the Garage.

Routine.—The general routine work of billing and mowing lawns, repairing pathways, forking and weeding shrubberies, renewing and making flower beds, propagating plants, and decorations in King's House, was regularly attended to by the Staff.

6. GORDON TOWN GARDEN.

The small garden at Gordon Town was kept in a tidy condition—its maintenance being met from the Hope Gardens Maintenance Vote.

7. BATH GARDENS AND NURSERY (ST. THOMAS).

Mr. Glen Campbell, Inspector of Plant Diseases, is in charge of this garden and nursery.

The Superintendent of Public Gardens visited this garden during the year.

Coffee Nursery.—The coffee nursery was maintained and seedlings sold to the public.

Routine.—The routine work of mowing lawns, remodelling beds, weeding and forking shrubberies, was regularly attended to.

8. FERN GULLY.

Regular visits were made to Fern Gully in accordance with the arrangements made by the Jamaica Tourist Development Board and the Government, for the maintenance and supervision of the Fern Gully. The funds are provided by the Tourist Development Board.

9. GENERAL.

Special visits.—A number of visits were made to the site of the King George's Jubilee Tuberculosis Sanitarium to lay out and supervise the planting of an avenue of trees (*Cassia Siamea*) along the driveway to the Hospital.

Constant Spring Hotel grounds.—The maintenance of these grounds by the Pomeroy Nurseries, was inspected at regular intervals.

A visit was made to Spanish Town to inspect the Public Park and suggestions made to the Superintendent of the Parochial Board for St. Catherine for the improvement of the layout of the Park.

Meetings.—The following meetings were attended by the Superintendent of Public Gardens—

The annual Staff Conference.

A meeting at the Land Settlement Office in connection with the recommendation for bathing beaches on the Palisades.

Committee meeting of the Jamaica Association of Sugar Technologists.

General meeting of the Jamaica Association of Sugar Technologists.

SUMMARY OF PLANTS DISTRIBUTED BY THE DEPARTMENT DURING THE LAST FIVE YEARS.

Plants.	1938.	1937.	1936.	1935.	1934.	Total.
Coffee ..	1,200	15,350	11,991	19,192	12,116	59,849
Cacao ..	..	150	50	..	..	200
Citrus seedlings	9,626	5,925	9,900	4,177	1,603	31,231
Citrus, budded plants	374	602	301	282	1,256	2,815
Mango, grafted plants	270	191	656	336	975	2,428
Cane Tops and cuttings	195,782	166,740	139,228	141,880	163,785	807,415
Elephant Grass cutting	..	..	..	..	600	600
Guatemala grass cuttings	2,400	21,461	..	..	..	23,861
Timber Trees	646	3,842	11,957	9,605	3,341	29,391
Miscellaneous fruit and economic plants	1,911	1,597	2,196	2,414	3,429	11,547
Ornamental Plants	25,436	16,407	22,653	28,094	26,867	119,457
	237,645	232,265	198,932	205,980	213,972	1,088,794

10. The Plantation and Garden Sales for the last five years have been as follows:—

	£	s.	d.
1938	306	14	3
1937	325	0	9
1936	387	7	11
1935	375	4	8
1934	509	13	1

11. The rainfall at the various gardens for the year under review is as follows:—

	Hope Gardens.	Castleton Gardens.	King's House Gardens.	Public Gardens Kingston.	Hill Gardens Cinchona.
January	0.44	12.12	0.18	0.14	3.04
February	1.19	9.77	0.78	0.14	5.76
March	0.59	1.64	1.03	0.94	1.84
April	4.33	4.17	3.85	0.39	4.34
May	1.58	21.97	0.90	0.60	2.78
June	2.15	7.24	2.62	2.05	2.78
July	2.31	8.47	2.97	0.76	3.24
August,	8.12	16.82	7.49	6.23	12.96
September	12.43	26.24	9.22	5.53	12.14
October	4.68	19.24	3.67	2.88	9.95
November	1.51	6.57	2.13	0.62	3.08
December	1.23	11.34	0.55	0.23	5.53
	40.56	145.59	35.39	20.51	67.44

Rainfall for the five years 1934 to 1938.

Year.	Hope Gardens	Castleton Gardens.	Kings' House Gardens.	Public Gardens Kingston.	Hill Gardens Cinchona.
1934	58.17	183.61	44.55	26.33	95.85
1935	53.75	189.10	44.03	27.78	84.64
1936	56.94	145.94	50.32	38.44	102.70
1937	49.19	180.53	43.78	28.05	86.74
1938	40.56	145.59	35.39	20.51	67.44

12. Contributions to the Gardens have been received from the following:—

LOCAL.

Mrs. J. M. Cradwick, Mereworth, Mandeville.
 Charles Williams, Swallowfield, Cross Roads P.O.
 S. C. Black, Widcombe, Liguanea.
 W. Keith Mitchell, Government Laboratory, Hope.
 Lady Cuffe, Stony Hill
 E. M. Brown, Forestry Department.
 Acting Agricultural Superintendent, Grove Place.
 Low Temperature Station.
 J. B. Kilburn, Halfway-Tree.

FOREIGN.

Mrs. Coblenz, 470 Park Avenue, New York City.
 Mrs. Nora Fitt, Trinidad.
 Economic Botanist, Royal Botanic Gardens, Kew.
 A. H. Fleming, Ancon, Canal Zone.
 Botanic Gardens, Christ Church, New Zealand.
 J. E. Higgins, Canal Zone Experiment Gardens, Summit, Canal Zone.
 Dr. Wilson Popenoe, Guatemala.
 Director of Agriculture, Mauritius.
 C. Englemann, Saffron Walden, Essex, England.
 Coconut Grove Palmetum, Florida.

M. S. GOODMAN,
 Superintendent of Public Gardens.
 E. J. DOWNES,
 Horticulturist.

B. AGRICULTURAL EXPERIMENTS, EDUCATION AND FIELD SERVICES.

(ii) Report of the Superintendent, Experiment Station, Hope.

Weather.—The rainfall at the Station for the year under review was 40.56 inches; this is much below the average for the past 57 years. During the months of August and September, there was a deposit of 20.55 inches, half the total rainfall for the year. Although water was always available for irrigation purposes, the flow was so small that only a small area could be covered daily.

Distribution of Cane Varieties.—During the year, 195,782 tops and cuttings of the different varieties of sugar cane were distributed, 41,750 of which were sent out from the Cornwall Nursery, Westmoreland. This makes a total of 5,186,685 tops and cuttings distributed free to estates and large and small cane farmers for the past 19 years.

The following is a list of the varieties and quantities distributed for the 5 years 1934 to 1938 inclusive

Varieties.	1938.	1937.	1936.	1935.	1934.	Total.
M.P.R. 28	50,354	41,456	11,695	792	12	104,309
P.O.J. 2878	47,026	65,939	73,273	58,961	73,449	318,648
F.C. 916	43,699	41,659	11,099	699	..	97,156
B. 2935	12,522	..	..	..	..	12,522
B. 3439	12,522	..	..	..	..	12,522
B. 3013	12,316	..	..	..	..	12,316
Uba	7,950	13,000	30,324	22,948	11,850	86,072
B. 3124	7,316	..	..	..	..	7,316
P.O.J. 2725	1,000	200	2,597	11,953	26,492	42,242
W. Trans.	318	266	1,364	1,272	3,773	6,993
Mex. Striped	300	262	312	300	824	1,998
P.O.J. 2714	285	3,033	2,078	12,262	18,548	36,206
Ba. 11569	100	250	6	1,544	1,121	3,021
Badilla	50	..	..	..	..	50
E.K. 28	24	475	2,116	3,485	2,784	8,884
B. 417	..	200	..	..	1,255	1,455
P.O.J. 2727	..	..	1,142	10,612	9,178	20,932
Co. 213	..	..	850	1,000	500	2,350
Co. 281	..	..	850	1,000	500	2,350
S. C. 12/4	..	..	511	864	3,808	5,183
B. H. 10/12	..	..	506	4,591	2,315	7,412
B. 726	..	..	505	9,197	6,764	16,466
H. 109	..	..	..	400	200	600
B. 891	..	..	..	..	412	412
	195,782	166,740	139,228	141,880	163,785	807,415

From the above list, it will be seen that the demand again this year for those varieties which are highly resistant to Mosaic Disease is far in excess of the demand for the more susceptible varieties. The small Cane Farmers, when applying for cane varieties, are supplied only with those which are resistant to Mosaic Disease.

Cane Varieties.—The varieties B. 3013, B. 2935, B. 3439 and B. 3124 have been distributed in small quantities to the estates. These varieties have also been sent out for variety experiment trials on estates. The varieties B. 3013 and B. 3124 seem highly susceptible to Mosaic, while the B. 2935 and B. 3439 show a lesser degree of susceptibility, in the Station. The B. 3439 flowered profusely, while the other three varieties showed no signs of flowering.

Of the later varieties received, we have been advised by the Cane Breeding Station, Barbados, to discard B. 3234 on account of its poor juice and B. 34130 and B. 34106 on account of their susceptibility to Mosaic Disease.

The varieties B. 34104 and B. 34117 are hardy types, and are being multiplied rapidly, both for experimental purposes and for distribution to Estates. These varieties are for the poorer types of soil where the B.H. 10/12 will not do well.

Other varieties such as B. 3127, B. 3138, P. R. 803, M.P.R. 42 and M.P.R. 63 will be set out in experimental plots in 1939.

The varieties B. 34129, B. 34120, B. 34137, B. 34105, B. 34134 and B. 3172 are at present under observation. If any seem worthy of trial, they will be set out in variety trials on estates during 1939, with the standard variety, B.H. 10/12, for comparison.

The Diamond 10 is so highly susceptible to Mosaic that it is not considered worth keeping in the collection.

Mayaguez 28 and F.C. 916.—Large quantities of these two varieties have been distributed to the small cane farmers and reports have been received that they are doing well and produce a good wet sugar. Both these varieties show a high resistance to Mosaic Disease and Root Disease. The latter variety shows promise of ratooning well under our conditions. During the dry period, both varieties resisted the drought remarkably well, better than most of the other varieties in the Station.

P.O.J. 2878.—A large number of tops and cuttings were again distributed this year to small farmers, but reports were received that some of these farmers were having trouble in manufacturing the juice into wet sugar. In places where this trouble exists, this variety should be mixed with another of better quality juice.

Only small quantities of other varieties susceptible to Mosaic Disease were distributed and these at special request.

Old varieties have been dug out and the land planted out in various new varieties.

Citrus.—A small nursery set out with Seville Orange stock has been budded with Valencia Orange, and plants are now available.

The Eddie Wasp (*Eretmocerus serius*, Sily) continues to keep the groves and young budded plants practically free of the Black Fly.

Some of the young budded plants were badly attacked by the green scale during the drought.

Coffee.—The coffee plot gave a good yield this year. The plot was pruned and received a heavy mulch of dry leaves during the year.

Mangoes.—A large quantity of Bombay Mango budwood was distributed during the year.

Pineapples. The pineapple plot which was planted out last year, fruited this year, and the plants remained fairly free from attacks of mealy bug.

Yams.—The Horn Yam gave a very poor return this year owing to the poor rainfall and the fact that no water was available for irrigation.

Diseases.—Mosaic Disease was kept under control by continual roguing.

Insect Pests.—There was little evidence of the attack of the Moth Borer, in the Station, this year.

Thrips.—The Mango trees suffered this year from a bad attack of Thrips. The mango crop was late but it was noticeable that the fruit fly was not so prevalent during the month of June as in previous years, when the fruits have not been fit for eating.

A large portion of the Station was given over to the Senior Agricultural Officer for Nutrition Food Crop plots, thus reducing the area under cane cultivation.

The general routine work of weeding, billing, ploughing, irrigating, etc., was attended to and the Station kept in a tidy condition.

M. S. GOODMAN,
Superintendent.

(iii) *Report of Superintendent of Sugar Cane Experiments.*

Weather.—The rainfall during the period under review was below the average. Trelawny suffered during the first half of the year from a severe drought but the weather in the latter half of the year was more favourable. The good distribution of rainfall during 1937 was partly responsible for the increased production of sugar this year—the highest on record—and there were no exceptionally heavy rains to cause damage to cultivations.

Production.—The output of sugar for 1938, according to the Sugar Manufacturers' Association, was 118,188 tons. This is a record production of sugar for Jamaica.

The above figure does not include the amount of wet sugar made by the small cane farmers whose canes are ground in a small Chatanooga mill and the juice boiled in open batteries. The quantity of wet sugar so produced varies from year to year and is sold only in the local markets.

The sucrose and purity of the juice were good throughout the reaping season, some estates taking less than 7 tons of cane to make a ton of sugar at periods during the reaping.

Due to the low rainfall during the early part of 1938, and the effect this has had on the non-irrigated cane districts, it is estimated by the Sugar Manufacturers' Association that the 1939 crop will be about 115,500 tons of sugar. The production in the irrigated areas should be approximately the same as that of last year. It is fortunate for Jamaica that a portion of the cane districts are in the irrigated areas and not affected by drought.

Varieties.—Planters are very keen on receiving new seedlings for trial, and during the year, small quantities of cuttings of B.3013, B.2935, B.3439 and B.3124 were distributed to each estate. Variety experiments with these seedling canes, using the B.H.10/12 as a comparison, have been set out on estates. There are several other untried seedlings in the collection which cannot be distributed until they have been tested out in comparison with the standard varieties.

The varieties M.P.R.28 and F.C.916 were reaped this year, for the first time, on a few estates, but the areas were so small that the results cannot be taken as being of any value.

The M.P.R. 28 appears to be a variety which likes a particular type of soil for its requirements, as, in some cases, it has given a very poor yield compared with that of other varieties. The F.C.916, on the other hand, has a wider range of soil in which it will do well, but unfortunately the juice is not as good as it should be.

A sufficient acreage of these two varieties should be reaped in 1939, from which data can be obtained to enable us to arrive at more definite conclusions.

B.H.10/12 is still the predominant variety and the greater part of the cane areas planted is in this variety. It still remains the best ratooning cane particularly in rich deep alluvial soils. It is by far the best variety to grow from a factory point of view, and it can, under certain conditions, make a wonderful recovery after drought.

P.O.J.2878. The areas planted out in this variety have increased annually both in districts where it is difficult to control Mosaic Disease and in areas where canes are grown by small settlers for factories. The yield of sucrose is moderate and difficulties have been encountered in the factory treatment of the juice. As a plant and first ratoon, this variety gives a very good tonnage, but is not very suitable for long ratooning and, in view of this, is being replaced by B.H.10/12.

The varieties B.H.10/12 and P.O.J.2878 predominate, and there appears to be little prospect of their place being taken by other varieties in the near future.

P.O.J.2725. A small area was planted out in this variety for early reaping, it is not as good a ratooning cane as P.O.J. 2878. It is often very severely attacked by the moth borer.

P.O.J. 2727 has again been planted fairly extensively in areas which are considered poor by planters. The yield of plant cane for these areas, is generally high, but the decrease is very rapid in the ratoons, hence long ratooning is impossible. The sucrose content of this cane, on the average this year, was fairly good.

E.K. 28, grown on estates in two cane districts, has given excellent results. The areas in which this variety can be grown are small but it gives a wonderful tonnage and surpasses any other variety. It also ratoons well in these areas.

S.C. 12/4, in certain areas, has given fairly satisfactory results both as plants and first ratoons, but is gradually being discarded in other areas owing to its poor ratooning quality. This is an early maturing cane and suitable for those districts where reaping has to be started early, but, unfortunately, it is very susceptible to Mosaic Disease in addition to being a poor ratooner.

Co.281 and Co.213, planted in small areas, have given good results, but the ratoons have not produced as high yields as last year. The results obtained from them show that they may be valuable as special purpose canes, while their characters make them unsuitable for general planting. In the variety experiment plots in Vere, which were reaped this year, these varieties gave a yield superior to all others.

B.726 has been very disappointing and has not come up to expectations. Although a good yield may be obtained from the plant canes, they die out badly in ratoons and are also very susceptible to Mosaic Disease. On account of this planters have had to discontinue the planting of this variety. This is to be regretted as the sucrose is very high.

Small areas of other varieties have been planted out, but these must be regarded as experimental. It is to be regretted that, from records received, the third largest planting was in mixed varieties. In spite of the fact that there is a disadvantage in growing mixed varieties in the same field, and that this disadvantage has often been pointed out, the bad practice still continues. There is nothing to be gained by mixing varieties in the same field; on the other hand, a great deal is lost both in tonnage and sucrose, owing to varieties maturing at different ages.

Yields.—The yields of canes per acre, both in plants and ratoons, have been very good for the entire Island this year, and this is partly due to climatic conditions and to better methods of cultivation. In one cane district, the average yield of plants and ratoons was nearly 50 tons per acre. In this area, the increase was obtained chiefly by revised methods of cultivation.

There has also been a marked increase in the use of artificial fertilizers on canes and it would be advisable for planters to carry out some simple experimental trials of their own, as it would lead to a better knowledge of their requirements and better results would certainly be obtained.

Cane farming.—Cane farmers are producing a large quantity of the cane now being supplied to the factories. It is estimated that such production totals about 25% of the cane ground throughout the Island. This production should continue to increase, as the small banana farmers, residing in a cane area, has been compelled to cease the planting of bananas owing to the ravages of Panama and Leaf Spot Diseases.

There is also a steady increase in the canes grown by small settlers for the manufacture of Wet Sugar. When the price of Wet Sugar is low, some of these settlers sell their canes to the factories. The limit of production by these small settlers will, however, have to be controlled sooner or later if the Sugar Quota is not increased, as the local market for the sale of Wet Sugar is very limited.

Manurial and other Experiments.—Manurial experiments were reaped at Holland, Worthy Park and Richmond. The experiments at Holland and Richmond have been discontinued. Cane variety experiments were reaped both early and late in the year, at Belle Isle, Golden Grove, Plantain Garden River, Hyde Hall, and Monymusk. Cane variety experiments were laid out with new varieties at Serge Island, Richmond, Monymusk, and Morelands, and at Sevens for early and late reaping.

Cultivation.—It is a pleasure to report again that the cane planters are taking every opportunity to improve their cultivations, where possible. Some are putting in small experiments of their own and not depending on the Department to do it for them, although the Department's advice is sought. The results of better cultivation can be seen in the increase in sugar manufactured in the past few years.

Extension.—There has been practically no increase in acreage in view of the small quota allotted to Jamaica. In fact, some estates had to reduce their planting programme.

Factories.—The large Central Factory that is being erected at Frome Estate, Westmoreland, will be completed in time to take off the 1939 crop. This factory will now crush the canes that were crushed by seven factories previously.

Some of the other factories in the Island have been improved.

Diseases.—Mosaic Disease is still prevalent in a few small areas but planters are taking the precaution to plant only resistant varieties. In some areas, Mosaic is so well controlled that the susceptible varieties are being increased.

Insect Pests.—The Moth Borer, which is controlled by natural enemies, was not much in evidence this year.

The Sugar Cane Aphis was not much in evidence this year.

Tours.—Dr. A. E. S. McIntosh, Ph.D., B.Sc., Geneticist of the Central Cane Breeding Station, Barbados, arrived in the Island on the 27th September and remained for 17 days. During this period, he visited estates in various parts of the Island and had the opportunity of discussing with planters the varieties of cane suitable for their districts. Dr. McIntosh also left with the Department notes on some of the varieties recently received from the Plant Quarantine Station, Trinidad, and which have been distributed to planters.

Visits.—A few special visits were made to estates during the year, but these visits had to be curtailed as the travelling allowance provided was insufficient.

Planters look forward to these periodical visits, when they discuss new methods and ideas and get the benefit of the Department's advice. These visits are of mutual benefit both to the planters and to the Department.

Planters, when in Kingston, also call at this office to discuss matters of interest to them.

M. S. GOODMAN,
Superintendent, Sugar Cane Experiments.

(iv) *Annual Report of the Headmaster of the Government Farm School.*

I have the honour to submit the report of the Headmaster, Government Farm School for the year ending December 31st, 1938.

Enrollment.—During the year under review, the enrollment at the Government Farm School showed an average of 52 students in attendance which was the same number as during the year previous. During the Christmas Term however, the enrollment was 59, the highest since 1929. The distribution of the total number of students by years was as follows:—

Term.	Years.			Total.
	I	II	III	
Easter (January 17th to March 30th)	17	18	14	49
Midsummer (April 19th to July 8th)	17	18	14	49
Christmas (September 26th to December 16th)	24	17	18	59

The following figures show the average enrollment of students at the School during the last five years:—

1938	52
1937	52
1936	49
1935	44
1934	44

Scholarships.—During the year there were 10 students in attendance who were in receipt of scholarships. The distribution of this number was as follows:—

	Easter.	Midsummer.	Christmas.
Department of Agriculture Scholarships	2	2	2
Trade Scholarships (Technical School)	6	6	3
Trade Scholarships (Practical Training Centres)			3
Merrick's Scholarships	2	2	2

Scholarships to the Farm School for students from the Practical Training Centres were awarded for the first time, and three students from Holmwood attended. These students are well grounded in practical work.

Graduation.—The Annual Graduation at which Diplomas and Prizes were awarded was held on Friday, July 8th. His Excellency, Hon. C. C. Woolley, C.M.G., O.B.E., Officer Administering the Government, very kindly presided and made the presentations. Diplomas in Practical Agriculture were awarded to the following Students:—

Alfred Augustus Brown, Baillieston, Alston P.O., Clarendon.
 Leslie St. Aubyn Birch, Fellowship P.O., Portland.
 Gerald Augustus Evans, Kingston.
 Albert Ansley Falconer, Somerton, St. James.
 Daniel J. Burgher, Cedar Valley, St. Thomas.
 Oswald Egerton Gardner, Troja, St. Catherine.
 Guy Barrington Grant, Hyde Hall, Trelawny.
 Lloyd Wilberforce Gray, Swift River, Portland.
 Walter George Miller, Kingston.
 Ridley W. Robinson, Pembroke Hall, St. Mary.
 Martin Roberts Tapper, Borobridge, Clarendon.
 Georgian Beatty Thompson, Glen Islay, Westmoreland.
 Dudley J. Phillips, Jericho, Hanover.
 Norman Bertram Vickers, Bluefields, St. Elizabeth.

Through the courtesy of the Director of Prisons the Band of the Stony Hill Industrial School was in attendance during the afternoon, and I wish to express my appreciation of the service rendered in providing the music for the function.

Prize Awards.—The prize awards were made as follows:—

The Cup donated by the Hon. A. C. Barnes, C.M.G., to the best all-round student was awarded to Guy Barrington Grant, a Third Year Student. In awarding this Cup consideration is given to scholastic standing, ability on the Sports Field, and interest taken in school activities.

The prize of a cricket bat donated by H. C. Virtue, Esq., Sports Master, for the Student making the greatest progress in cricket during the year was awarded to M. R. Tapper, a Third Year Student.

Exhibit of Work.—An exhibit of work done by the students was held in the Carpentry Shop, after the Graduation. Visitors were also shown over the Farm.

Health of the Students.—The health of the students was uniformly good during the year and no serious illness was reported.

Employment of Students.—The employment situation with respect to students showed some improvement, and while there were a number of students still unemployed, the number is considerably less than during the previous year.

Sport.—Football and cricket comprised the main sports at the School, and all students were encouraged to take part.

Football.—The Farm School entered a team in the Second Division of the Jamaica Football League, and tied for fourth place in the Competition. A team was also entered in the Junior Knockout Competition and reached the semi-finals. Inter-house matches were also played, Olivier House winning the Competition.

Cricket.—A cricket team was entered in the Evelyn Cup Competition, and completed the season by reaching the finals. In cricket as in football inter-house matches were also played.

Sports Day.—The Annual Sports Day at the Farm School was held on Wednesday, March 30th, and was most successful, with a record attendance. All events were keenly contested. I take this opportunity of expressing the thanks of the School to all those persons who so generously contributed to the success of the day.

G. B. Grant, a Third Year Student at the School was selected to represent Jamaica at the Pan-American Olympic Games held in Panama. Grant entered the 1,500 metre and the 5,000 metre events and won both, establishing a West Indian record.

Rover Crew.—During the year a Rover Crew with a membership of 16 was formed at the School, under the leadership of Mr. V. A. Valentine, Junior Assistant Master. The Crew meets every Tuesday afternoon and takes an active part in Rover activities in St. Andrew and Kingston.

Student Christian Movement.—The Farm School Branch of the Student Christian Movement completed another successful year's work under the direction of Mr. E. B. Hallett, Secretary of the Y.M.C.A. Unfortunately for the School, Mr. Hallett accepted another position which necessitated his going to the country, and he had to relinquish leadership of the Branch at the School which he has held for many years. The School regrets very much Mr. Hallett's absence in this phase of its activities and wishes him success in his new field of work.

Mr. Hallett's place was taken by Mr. Edwards, present Secretary of the Y.M.C.A.

Through the generosity of the Reverend Kent of the First Church in Boston, the School was most fortunate in receiving the donation of a portable organ. The gift was very much appreciated and will assist in improving the services of the Farm School Branch of the Student Christian Movement, held every Sunday.

Tours by Third Year Students.—During the year the Third Year Students made several trips into the country where they visited estates and holdings. The following visits were made on the various tours:—

February 2nd—Visited the United Fruit Company's properties in St. Catherine.

February 9th—Visited the Jamaica Sugar Estates at Duckenfield.

February 23rd—Visited the vegetable plots at Old Harbour.

June 7th—Visited Stone's Hope and the West Indian Training College.

June 14th—Visited Brockenhurst and New Forest Demonstration Plots, and visited small holdings in the district.

October 27th—Visited the Pickapepper Sauce Factory and the Practical Training Centre at Holmwood.

November 3rd—Visited the Demonstration Plots at Brockenhurst and New Forest, the Lititz Fibre Factory, and small holdings in the district of Spur Tree.

The Students gained considerable knowledge from such visits, and I take this opportunity of expressing my appreciation of the facilities granted in making such visits possible.

Grove Place.—Half of each term was spent at Grove Place by the Third Year Students, where practical experience was given under estate conditions. Such experience is of great value to the Students and assists them after leaving School when they take up work on a property.

The accommodation at Grove Place for the Students was increased during the year so that now 22 students can be accommodated instead of 14 as formerly.

Advisory Board.—No meetings of the Farm School Advisory Board were held during the year.

Demonstration Plots.—The Farm School Demonstration Plots at Hope, are well established and provide scope for teaching practical Field Husbandry to the Students. All crops are grown, but the progress of the work is seriously handicapped by the lack of water, without which it is impossible to grow such crops as vegetables during the early months of the year.

Extension Work.—The Annual Departmental Conference was held at the School on January 10th, and the Conference of Sugar Technologists on December 10th.

A series of articles on "Livestock in the West Indies" was published in the Journal of the Jamaica Agricultural Society during the year.

Visitors.—The number of persons visiting the School during the year totalled 504, an increase of 146 over the previous year. Included in this number are those attending the two Conferences held at the School. The visitor's book shows the following visitors registered

Departmental Conference—January 10th	66
Graduation, July 8th	23
Conference of Sugar Technologists—December 7th ..	73
Parties of School Children and members of the Jamaica Agricultural Society	322
Individual Visitors	20
	504

It is encouraging to note that the number of parties of School Children and Branches of the Jamaica Agricultural Society is increasing. Arrangements are made for such parties to be shown over the School and provision is also made for them to use one of the buildings in which to have lunch if they desire.

Staff.—There was no change in Staff during the year.

Leave.—The following leave was taken by members of the Staff during the year:—

J. W. Howe, Headmaster—May 30th to October 10th.

J. M. McEwen, Senior Assistant Master—September 10th to September 24th.

H. C. Virtue, Assistant Master—July 9th to September 3rd.

V. A. Valentine, Junior Assistant Master—August 29th to September 17th.

Miss M. Goodman, Typist—September 19th to January 31st, 1939.

I wish to take this opportunity of expressing my thanks to the members of the Staff of the Farm School for their assistance and co-operation during the year, and also to the members of the other Divisions of the Department for the help rendered to the School.

J. W. HOWE,
Headmaster.

(v) *Annual Report of the Farm Superintendent.*

I have the honour to submit the report of the Farm Superintendent for the year ending December 31st, 1938.

Weather.—The total rainfall for the year amounted to 10.56 inches, which was 7.61 inches less than the previous year. The lack of moisture was felt during the year and short pasture conditions prevailed, which made the feeding of the milking herd difficult.

LIVESTOCK.

Numbers.—The total number of head of livestock at the end of the year was 599, an increase of 58 over the previous year. The number was made up according to the following figures:—

	1938.	1937.	1936.	1935.	1934.
Bulls	38	34	33	27	23
Purebred cows and heifers ..	32	37	42	46	50
Grade cows and heifers ..	499	433	387	364	313
Mules	23	22	23	23	23
Horses	4	4	4	2	1
Steers	13	11	13	13	14
	599	541	502	475	424

The present size of the herd makes feeding difficult, especially during the early months of the year when there is a lack of rainfall, but the high requisitions for milk from the Public Institutions make it necessary to keep a large herd of milking cows.

Value of Livestock.—The value of the livestock on the Farm at the end of the year was £7,238 2s. 6d., which is an increase of £100 18s. 6d. over the previous year.

The prices for livestock in the Island were maintained during the year and butcher stock showed a slight increase in price.

The following figures show the number of head of livestock on the Farm for the last five years and the value:—

Year.	No. head.	Value.
		£ s. d.
1938	599	7,238 2 6
1937	541	7,127 4 0
1936	502	7,175 18 0
1935	475	7,607 13 0
1934	424	8,194 10 0

Calvings.—The total number of calves dropped during the year was 202, an increase of 35 over the previous year. Of this number 108 were heifer calves and 94 bull calves. One set of twin bull calves was dropped during the year.

The figures below show the number of calves from each sire:—

	11 Bull Calves	18 Cow Calves
Bess's Pusa	11	15
Fon 70A	12	11
Paymaster	13	13
Hope Foremost 6th	9	10
Sir Douglas	11	9
Corolla's Pusa	11	9
The Mayor	7	8
Premier	4	5
Foremost Vigor	6	2
King Beauty	5	3
Hope Fon 4th	1	1
New Deal	2	3
Sir Keyes Wayne	2	1
Unknown	2	1
Hope Theagenes 4th	1	1
	94	108

Importations.—During the year a purebred Jersey bull was imported from Maplecrest Farms, Dunstable, Massachusetts, and landed on May 8th. This bull is "Fauvic Owl of P.M." and has proved to be an excellent sire, both in type and breeding.

Health of the Stock.—The health of the livestock on the Farm is covered more fully in the report of the Senior Veterinary Officer, and on the whole was uniformly good, no serious or contagious disease being reported.

The number of deaths during the year was 33. The Farm was unfortunate in losing both Red Poll sires during the year.

Sales of Livestock.—The total sales for the year amounted to 100, of which 43 were sold for breeding purposes and 57 to the butcher.

The bull calves sold to the public for breeding were:—

Grade Jersey	16
Grade Holstein	12
Grade Guernsey	13
Grade Red Poll	1
Purebred Red Poll	1
	43

The butcher stock sold was:—

Cows	21	Old age and non-breeders
Heifers	11	Non-breeders
Steers	1	Old age.
Calves	24	Sold for veal, due to inferior type or breeding.

57

No animals were sold for export from the Farm during the year. Two yearling bulls were sold for breeding during the year, one a Jersey-Guernsey and one a Montgomery-Jersey.

Poultry.—Two flocks, one of Rhode Island Reds and one of White Leghorns were maintained at the Farm during the year, and breeding stock, baby chicks and eggs for hatching were sold.

There was a keen demand for baby chicks during the year and the demand for breeding stock also showed some improvement.

The following figures show the sales of the various classes of poultry for the year:—

		Rhode Island Reds.	White Leghorns.	Total.
Cockerels	..	5	5	10
Pullets	..	..	..	..
Baby chicks	..	251	22	273
Eggs for hatching	..	4 doz.	2 doz.	6 doz.
Eggs for table use	..	265 doz.	94.5 doz.	359.5 doz.
Birds for table use	..	7	..	7

More interest is being taken in poultry raising, both in the parish of St. Andrew and in other parts of the Island.

Public Stud Services.—During the year two Guernsey bulls were available to the public for stud services. The total number of cows sent for service was 30. Having such stud animals available is improving the type of dairy animal raised, especially in lower St. Andrew and the surrounding district.

PRODUCTION AND SALES OF DAIRY PRODUCTS.

Milk Production.—The total production of milk from the dairy herd at the Farm for the year was 306,341 quarts, an increase of 31,062 quarts over 1937. There has been a uniform increase in production of milk from the dairy herd as the following production figures for the last five years show:—

Year.	Total.	Average per day.
1938 ..	306,341	839.3
1937 ..	275,279	753.3
1936 ..	264,899	723.8
1935 ..	267,429	732.7
1934 ..	254,448	696.8

Milk Sales.—The total sales of milk for the year amounted to 259,761 quarts, an increase of 23,156 over the previous year. The requisitions from the various Public Institutions have increased to such an extent within the last year, that at times it is not possible to supply the amounts despite the fact that the dairy herd is larger than at any time in the history of the Farm.

The increase in sales is shown by the figures below:—

1938 ..	..	259,761 quarts
1937 ..	..	236,505 "
1936 ..	..	221,207 "
1935 ..	..	210,202 "
1934 ..	..	196,971 "

Average Production per cow.—The average daily production per cow showed a slight decrease of 0.08 quarts over the previous year, while the average fat test of the milk also showed a slight decrease of 0.15%. The figures given below show a comparison of the production and test for the past five years:—

Year.		Avg. No. cows milking.	Avg. daily production per cow (qts.)	Avg. daily yield for herd (qts.)	Avg. butterfat content (per cent.)
1938	..	164	5.12	839.3	5.05
1937	..	145	5.20	753.3	5.20
1936	..	145	5.00	725.7	5.10
1935	..	140	5.20	732.6	5.00
1934	..	135	5.16	697.1	5.22

Milk Production by Breeds.—The herd and breed average production for cows calved during the year is shown by the following figures:—

The Herd Average for 141 head of milking cows was 4,343 lbs. milk in 321 days.

Average production by breeds:—

Breed.	No. head.	Production (lbs.)	No. days.
Grade Jerseys ..	48	4,399	326
" Guernseys ..	42	4,509	319
" Holsteins ..	15	5,318	331
" Montgomery ..	14	3,992	277
Purebred Jerseys ..	4	4,259	328
Purebred Red Polls ..	3	4,049	348
Miscellaneous ..	13	3,874	317

Records of twenty-five highest producing cows during the year.

Name.	Dam.	Sire.	Breed.	No. lbs. milk.	No. days.	No. calving.
Martha	Marchioness 12th	Posch	Grade Holstein	8,658	365	2
Splosch	Susy	do.	Grade Holstein	7,485	365	3
Doreen	Dodo	do.	Grade Holstein	7,034	365	2
Conora	Norbrook 2nd	Colin	Grade Guernsey	6,996	365	6
Naomi	Norbrook 4th	Victor 63rd	Grade Jersey	6,734	365	2
Susuki 2nd	Susuki	Posch	Grade Holstein	6,273	364	2
Bosch	Bess	do.	Grade Holstein	6,250	361	3
Pergola	Perfect	Glen	Purebred Jersey	6,225	365	6
Minnie 1st	Minnie	Foremost	Grade Guernsey	6,219	365	1
Moco	Monica 6th	Colin	Grade Guernsey	6,082	365	5
Conora 1st	Conora	Posch	Grade Holstein	6,080	365	2
Paste 1st	Paste	Pogis 99th	Grade Jersey	5,928	365	8
Norma	Norbrook 3rd	Pusa	Grade Montgo- mery	5,915	365	7
Poster	Pobess 5th	Foremost	Grade Guernsey	5,886	365	3
Alicia 1st	Alicia	Norvic	Grade Jersey	5,750	365	1
Bess 4th	Bess 2nd	Hope Pogis	Grade Jersey	5,729	346	5
Meme	May 3rd	Foremost	Grade Guernsey	5,680	365	3
Saysa 1st	Saysa	Hope Victor	Grade Jersey	5,670	365	2
Polda	Tilda 4th	Pogis 99th	Grade Jersey	5,653	360	6
Pear	Pergola	Porpus	Grade Jersey	5,523	365	1
Quassia 1st	Quassia	Posch	Grade Holstein	5,519	365	1
Norbrook 5th	Norbrook	Pogis 99th	Grade Jersey	5,512	289	8
Garter 1st	Garter	Foremost	Grade Guernsey	5,488	365	2
Sherry 1st	Sherry	Hope Pogis	Grade Jersey	5,382	357	4
Vamp	Shrew 13th	Foremost	Grade Guernsey	5,335	365	3

FEEDS AND CROPS.

The feed situation on the Farm becomes acute during the early months of the year when there is a lack of sufficient rainfall, and if the herd is to be increased some provision for irrigation will be necessary.

Feed used.—The following are the amounts of the various feeds used during the year:—

Coconut Meal	..	..	106.5 tons
Cottonseed Meal	..	..	35.5 "
Bran	..	..	20.0 "
Linseed Meal	..	..	9.5 "
Milk Powder (skimmed)	..	..	12.0 "
Oats	..	..	300.0 bags
Rock salt	..	..	54.0 "
Corn (native)	..	..	137.5 bushels
Cane (grown on the estate)	..	..	701.0 tons
Silage, guinea corn (grown on the estate)	..	..	600.0 "

Pasture.—Guinea grass provides the main pasture for the herd, but fails quickly as soon as the rains stop. Seymour grass is also well established on the Farm but provides a poor quality of pasture and cannot withstand drought conditions, although it does give rapid growth when there is sufficient rain. It cannot however, be relied upon for pasture. Guatemala grass is doing well and seems to withstand drought better than guinea grass.

Silage.—A total of 53 acres was planted in guinea corn for silage and a good crop was reaped. Silage is most necessary in order to provide sufficient roughage for the herd during the early months of the year, but cannot take the place of good green pasture.

Mangoes.—The sales of mangoes totalled 6,792½ dozen for the year. All mangoes for export were handled through the Marketing Division of the Department. The local demand is decreasing as many of the trees in the Liguanea area have been budded to the Bombay variety.

Re-afforestation.—The programme of re-afforesting the Liguanea Ridge was continued under the supervision of the Forest Officer, with good results. An attempt is being made to establish trees above the spring which provides the dairy buildings with water.

BUILDINGS AND IMPROVEMENTS.

Top Yard.—The pens in the cattle house at Top Yard were removed during the year and stanchions installed. The housing accommodation was increased from 64 to 100.

The building is being used to house the young heifers and the additional accommodation is most useful owing to the increase in the herd.

General Repairs.—Repairs to the buildings and equipment were made during the year.

Fencing.—Hope Pastures, acquired by the Farm in 1938 was refenced during the year.

EXTENSION WORK.

Visitors.—The number of visitors to the Farm increased over last year. The majority of visitors are in parties comprised of either School Children or Branches of the Jamaica Agricultural Society. Arrangements are made for a guide to show the parties over the Farm and to explain the work being done.

Assistance was rendered to Mr. R. D. Binns of Southfield in shipping two Jacks to Costa Rica, and also to Mr. G. P. Dewar of Duncans in shipping an Aberdeen Angus bull to the Bahamas.

Leave.—I was away from the Island from May 30th to October 18th, Mr. J. M. McEwen acted as Farm Superintendent during my absence.

I take this opportunity of expressing my thanks to the members of the Staff of the Farm as well as to the various Divisions of the Department for the assistance and co-operation rendered throughout the year.

J. W. HOWE,
Farm Superintendent.

(vi) *Report of Superintendent Grove Place Stud Farm and Experiment Station.*

A.—WEATHER.

The rainfall for the year continued to be under the average. There was a precipitation of 71.51 inches over 121 days. The best period for the year was August to October, when there was a precipitation of 30.09 inches, while the driest period was January to March, when there was only 7.13 inches.

The average fall for the previous six years was 100.59 inches, inclusive of the abnormal rainfall of 133.59 inches in 1933, and 134.72 inches in 1936.

B. EXPERIMENT STATION.

The Station now embraces several Sections:—"A" (Nursery, Banana, Coffee, Citrus, Papaya, Pine Apples and Vegetables); "B" (Grapefruit, chiefly of "Marsh Seedless" Variety); "C" (Fodder and Ground Crops, e.g.:—yams, cocoas and potatoes); and "D" (Citrus, Guatemala Grass and Cover Crops).

In addition to the Sections mentioned there are two large scale, long-range Manurial Experiments involving 16 acres of grapefruit and 5 acres of bananas.

Fertilizer trials are also being conducted in connection with maize and various varieties of peas and beans, including Soyas and Groundnuts.

These various sections serve as a source of instruction to the Agricultural Students as well as to the farmers who visit the station.

Valuable data is being collected from experiments, and in due course very useful information will be available to all interested farmers.

CROPS.

(1) *Fodder Crops:*—

I. Alfalfa.—Four small plots were established during the year and there are now fully six squares under cultivation.

One plot was set out under Papaya trees to test its behaviour under shade.

This experiment is sufficiently advanced, and has so far demonstrated that this crop will not flourish under shade.

The other plots are all doing well. When fully established, and with average weather conditions, it is possible to reap at a four week period yielding at the rate of 800 lbs. per square chain, or fully 57.6 short tons, per acre per annum.

It is proposed to continue these trials with a view to extending and testing out the crop under pasture conditions.

Innoculated seeds have been distributed to eight persons throughout the Island.

II. Clover.—Both varieties (Hubam) and (Australian Red), proved very unthrifty and unable to stand up to the dry spells. The trials have been discontinued.

III. Guatemala Grass.—This grass continues to do exceedingly well and responds splendidly to the application of farm manure. The area of 1.5 acres became fully established during the year, and helped considerably as feed for the Dairy Herd.

Trials have been conducted in reaping at intervals of 4-5 and 6 weeks for the dairy cattle, and when cut at the earliest stage, it is decidedly noticeable that the animals find it far more palatable than when reaped at the longer periods. In this instance a fair percentage is always left over.

Under average weather conditions it produces in four weeks 1,224 lbs. per square chain, or fully 73 short tons per acre per annum.

IV. Elephant Grass.—In February a small plot of this grass was set out, and as the period was particularly dry, we had to resort to watering. The roots have developed wonderfully and cuttings have been taken and the area extended.

It is proposed to make trials of comparative yield tests in connections with these two grasses and Uba Cane.

(2) *Cover Crops:*—

I. Overlook Bean was established with success as a cover for bananas as well as for a varietal plot of citrus at Section "D."

II. The trials in connection with *Indigofera endecaphylla* and *Centrosema pubescens* through the banana plot in Section "A", was continued, and it is encouraging to report that both these covers (especially the former), are being established with very good results. Several planters who have visited the plot acclaim *Indigofera* as the best cover they have seen.

(3) *Tobacco*:—

The small plot of one square chain which was set out late in 1937 was reaped during the early part of the year.

Fully 346 lbs. of suitable leaves were reaped and dispatched to the Tobacco Specialist, who subsequently reported that on curing, the sample produced was of very good quality.

In view of this encouraging result a further trial is being conducted.

(4) *Citrus*:—

All trees at Sections "A", "B" and "D", were rondeared and given two sprayings of "Sulfinette," and two dressings of "basic mixture," the amount at each dressing varying from $\frac{1}{2}$ lb to 2 lbs., according to the age of the tree.

A heavy crop was set, but only a small percentage has already been reaped and sold as there was little or no demand for grapefruit since the early part of the Season.

Quite a number of the trees at the Manurial Experimental Plot (16 acres), came into bearing and were allowed to mature fruit.

Fruits from individual trees were reaped, counted, sized and tests made as to juice content, flavour and average number of seeds per fruit. The reaping is not yet completed as there still remains fruit not yet matured.

The lime trees existing under pasture conditions, received a through pruning during the year, and fully 84 boxes were reaped and disposed of through the Marketing Division of the Department.

The Survey of Fiddler Beetle and Slug Control was continued throughout the year, when fully 56,943 Beetles, 24,359 Egg Masses and 368,078 Slugs were collected and destroyed.

In addition to hand-picking, the usual practise of biological control of the Fiddler Beetle by a system of breeding and liberating control wasps (*Tetrastichus haitiensis*) was maintained.

The use of "Ostico" in controlling slugs has been discontinued, as in practice it has not proved successful.

(5) *Coffee*:—

Several of the trees at Section "A", which suffered from exposure during the last year, were replaced with young seedlings. The bananas for shade were replanted in June, and these have greatly helped in augmenting the amount of shade given by the permanent trees.

Several young Guango seedlings were set out through the plot. These will ultimately assist in providing sufficient permanent shade and eventually enable us to dispense with the bananas as temporary shade.

(6) *Banana*:—

The Plot comprising of nine-tenths of an acre at Section "A", which was replanted in June last year, matured fruit during the year, and 290 stems, grading 60% were reaped. The low grading was mainly due to the dry period experienced between November last year and March this year, and to a less extent, to the incidence of *Cercospora* (Leaf Spot). This disease has been kept under control by constant and regular spraying with Bordeaux Mixture.

(7) *Papaya*:—

A nursery was established with seed selected from the best fruit of the trees from the plot at Section "A". These trees have now shown signs of Anno Domini, and seedlings have been set out between the old trees which will be removed after the present crop.

The young trees treated with compost manure are very thrifty and will come into bearing next year.

(8) *Pine Apple*:—

This crop is at its best in a warm, dry climate, and so does not thrive as well here as at Hope. However, from the results obtained last season, I am satisfied that fruit of fair size and quality of both Cheese and Ripley varieties can be produced in this locality.

The plants were removed at the end of the season, and replanted in a new plot

Pine should not be allowed to produce more than three crops, (plant and two ratoons), before replanting.

(9) *Vegetables*:—

Plots of the following have been cultivated and disposed of through the Marketing Division of the Department:—

	Area.	Quantity Produced.	Quantity Shipped.
I. Sweet Peppers	2 $\frac{1}{4}$ sqrs.	2,420 lbs.	1,620 lbs.
II. Egg Plants	1 $\frac{3}{4}$ "	2,518 "	1,883 "
III. Vegetable Marrows	1 sqr.	980 "	923 "

The quality of peppers produced here was described by the Development and Marketing Officer as the best grown in the Island. This is an indication that the Manchester "Red Dirt," (*Terra Rosa*), is well suited to its successful cultivation.

Several persons in this section of the parish have started vegetable cultivation for export, and it is hoped that the industry, especially of Sweet Peppers, Egg Plants and Marrows will help to improve the economic situation in this parish.

(10) *Potatoes*:—

A Manurial Experiment, involving nine-tenths of an acre, was undertaken in collaboration with the Agricultural Chemist, to whom details of the returns have been submitted.

This section of the parish is undoubtedly very adaptable to the successful cultivation of potatoes, and with the establishment of a branch of the Marketing Division of the Department, a great fillip has been given to this Industry.

(11) *Nursery*.—

I. The Citrus Nursery was maintained, from which we obtained several plants. Some were used for replacing dead and unthrifty plants on the Station. The demand for grapefruit budded plants was poor, and only 307 budded Citrus plants were sold.

We also supplied 1,400 buds of Valencia, Parson Brown and Lake Tangelo varieties.

II. Bitter Damsel.—After the distribution of 8,513 seedlings in bamboo pots, during 1936 and 1937, there was little demand for seedlings during the year, although they are delivered free to applicants.

Several hundred plants became overgrown, and after supplying only 575 seedlings, it was decided to discontinue propagation. A limited supply is still available for distribution.

C.—LIVESTOCK.

(1) *Cattle*.—

(a) The policy of grading up the herd representative of two breeds—Jersey and Guernsey with an infusion of Montgomery blood, has been continued. We have, by regular selection disposed of practically all individuals representing a combination of several breeds.

(b) Dairy Projects.—The following Projects in connection with dairy animals are in progress:—
Project (1).

Objects:—I. To test the economical use of concentrated feeds for Dairy Cattle under local conditions.

II. To find out the economical ratio of pound feed to pound milk production.

The tests in use are, 1 lb. feed to 5, 6 and 7 lbs. milk, respectively.

Plan:—I. To extend the feeding trials over four lactations.

II. The cows under test are divided into lots, and each lot will be tested under the three different ratio feeds.

N.B.—List of fourteen cows that have completed their first lactation.

Lot	Name.	Date Calving.	Ratio.	lbs. Milk.	lbs. Cream.	Lactation.
A	Robe	.. 12.8.37	1—5	4001.5	206.0	10 months
	Merriment	.. 20.8.37	1—5	4899.1	200.9	"
	Gertie	.. 1.11.37	1—5	4314.4	184.1	"
*B	Miss Lee	.. 28.5.37	1—6	4878.7	231.5	8 months
..	Miss V.	.. 4.5.37	1—6	2939.1	138.8	"
	Lily ..	.. 30.4.37	1—6	2626.7	145.5	"
	Vivia	.. 15.5.37	1—6	3873.2	207.6	"
	Audre	.. 3.5.37	1—6	3134.3	145.6	"
* (These cows calved before the test started—add 23. % production and arrive at 10 months lactation.)						
C	Pretty	.. 22.11.37	1—7	5066.1	229.0	10 months
	Julia	.. 2.12.37	1—7	5461.4	241.7	"
	Minetta	.. 30.12.37	1—7	5556.8	242.7	"
	Elaine	.. 30.12.37	1—7	5017.8	206.7	"
D	Adora	.. 17.2.38	1—7	5301.1	224.4	10 months
	Rescue	.. 9.2.38	1—7	3957.0	202.5	"

Project (2).

Objects: I. To obtain the best age for breeding heifers—for growth and production.

II. To determine the cost of rearing heifers.

III. To obtain a standard weight for age of Dairy Cattle.

Plan:— I. Long-range Experiment for at least seven years. The animals will finish the trial when they have reached maturity, which will be at the completion of their third lactation or at the end of the fifth year.

II. To grow out the heifers earlier and thus avoid loss in size and constitution.

III. To avoid over-crowding by the retention of unproductive animals, such as three and four-year old heifers that have not calved, as is the not unusual practice in Jamaica.

The number of heifer calves available are grouped in three lots:—

Lot "A" bred between 15 to 18 months

" "B" " " 19 " 21 "

" "C" " " 22 " 24 "

The heifers are placed in each lot alternately as they are born, and weights are taken monthly.

All lots are treated alike as to feed, care and management.

(c) *Milk Production*.—The total quantity of milk produced on the Farm for the year was 36,951 quarts, or an average of 101.2 quarts per diem.

The average number of cows milked daily was 19.5, with an average of 5.2 quarts per cow, per diem.

(d) *Butter*.—The quantity of milk available for making butter was 29,650 5 quarts, which yielded 3,323.5 lbs. of butter, or an average of 8.9 quarts to the pound. We were able to find a ready market at the Mental Hospital.

(2) *Mane Stock*.—

The imported stallion "Snow Boy," showed signs of rejuvenation during the year, when h

received increased patronage, as indicated by the figures for Services.

His daughter "Hebe", out of "Pinafore", which proved to be the champion two-year old of 1937, maintained her position and was acclaimed the champion three-year old of 1938.

The yearling "Kendal" (since changed to "Entellus") full brother to "Hebe," was sold to Dr. L. M. Moody. He is classed among the best-looking of the two-year olds, for 1939, and we entertain great hopes of him.

The imported stallion "Exaggerated" was also available for Service, but he received scarcely any patronage.

The proof ass "Senator Owen" maintained good health, and received slightly increased patronage to the previous year.

The advent of motor trucks has greatly affected the mule industry, for which there is now a very limited market.

The mares kept excellent health. Three of these:—"Simonette," "Santa," and "Corolla" have reached the end of their career, and it is proposed to recommend that these be superannuated.

In view of the gradual extension in the Field Husbandry Section of this Division, resulting in a decrease of pasture, the gradual decrease in the number of livestock on the Farm is necessary. This decrease in numbers, however, will in no way interfere with the usefulness of the Station.

(3) *Pigs*:—

There is still a very good demand for young stock. This project was very successful during the year, as shown by the number of pigs sold to the public. There has been a decided increase in the number available for sale, when compared with previous years.

The Farm Piggery consists of two boars (one native pure-bred, and one imported) and five sows.

(4) *Sheep*:—

It was decided to discontinue the keeping of Sheep, and the flock consisting of six head, was disposed of to the public.

(5) *Stud Services*:—

There was a decided increase in the number of mares and sows sent to the Farm, but a decrease in the number of cows and Jennets.

Animals at the Stud were:—

I.—Mane Stock: Stallions

Snow Boy

Exaggerated

Senator Owen

II.—Cattle: Jack Bulls

Fon A (Jersey)

Porpus (Montgomery-Jersey)

Hope Foremost 5th (Guernsey)

Selassie (Montgomery-Guernsey)

III. Pigs: Boars

Grove Viscount

Earl Charles

Copid Sweeping Charlie

{ Purebred
Berkshires

(6) The Tables given below show the Livestock at Grove Place in December, with their Valuation, Records of Service, Sales, Births and Deaths during the year.

TABLE I.—Livestock and Valuation.

	Cattle.					Other Stock.		Bees.	Total.
	Bulls and B.C.	Cows.	Grade Heifer.	C.C. 1938.	Steers.	Horse-kind.	Pigs.		
No.	7	63	55	13	4	37	10	10	
Valuation	£91	£664	£348	£29	£43	£574 10	£51	£10	£1,810 10

TABLE II.—Services, 1938.

	Mares to Stallions.	Mares to Jack.	Jennets to Jack.	Cows.	Sows.
Farm	5	3	2	95	7
Visiting	37	12	4	23	58
Totals	42	15	6	118	65

TABLE III.—Births, 1938.

	Foals.				Calves.		Pigs.	
	Colts.	Fillies.	Mule Cubs.	Donkey Cubs.	B.C.	C.C.	Boars.	Shotes.
No.	1	Nil	1	1	13	14	20	18

TABLE IV.—Sales, 1938.

	Draft Cattle.	B.C.	Colt.	Jack.	Rams.	Ewes and Lamb.	Sow.	Boars.	Shotes.	Total.
No.	14	12	1	1	3	3	1	21	16	72
Price	£104 6 8	£4 5	£100	£8 8	£5 10	£3 10	£2	£43 10 6	£16	£287 10 2

TABLE V.—Obituary List.

	C.C.	Cow.	Steer.	Horse.	Sow.	Pigs.
No.	1	1	1	1 destroyed	1	13 crushed at birth

D.—AGRICULTURAL EDUCATION.

As a result of an inadequate water supply, it was inconvenient to accommodate the Senior Farm School Students during the Easter Term.

In view of this, they were allowed to spend the full period (11 weeks) during Mid-Summer Term.

A second batch spent the usual half period of five weeks during the Christmas Term.

The students were engaged in the various activities of the Experiment Station including the Stock Farm. In addition, Field Days involving visits to Estates, Factories, Properties and Small Farmers' Holdings, were observed.

Several organised parties, consisting of members of Agricultural Branch Societies and School Associations, paid several visits to the Station for observation and instruction.

There were many individually interested visitors almost daily, for observation of the various projects in operation, as well as to discuss their own Agricultural problems.

I attended and acted as judge at the Agricultural Shows held at Nain, St. Elizabeth; White River Pen St. Mary; and New Green, Manchester.

E. LECTURES.

I attended and delivered lectures at the following meetings:—

Manchester Branches Associated (held at Grove Place).

Mile Gully Branch Society (Annual Meeting).

New Green Branch Society.

In addition, daily lectures and demonstrations were taken with the Farm School Students in residence.

F.—BUILDINGS AND EQUIPMENT.

The following improvements were effected during the year:—

I. The erection of additional accommodation for students, consisting of a two-storey structure attached to the existing school buildings, with a reinforced concrete aerial tank of 2,800 gallons capacity, which supplies water to the bath rooms.

The building is of reinforced concrete walls with galvanised roofing. The upper floor is used as a dormitory with accommodation for 24 students, while the lower floor comprises two bathrooms and a recreation hall.

II. Construction of two concrete tanks—one of 85,000 gallons capacity, which serves to improve the water supply for the stock, and the other of 23,000 gallons capacity, as a domestic supply.

In addition, an old tank of 65,000 gallons capacity, which had practically gone out of commission, was completely re-surfaced and is now giving excellent service.

III. The Stock Manager's Quarters have been improved by the addition of three apartments—dining room, bath and pantry.

IV. The building of three apartments, formerly used as domestic quarters at the Superintendent's residence, was improved and converted into offices for the Superintendent and Clerical Staff.

Accommodation as servants quarters, consisting of two apartments was erected at a more suitable location.

- V. A separator room was constructed at the dairy building. This will greatly facilitate certain phases of the work in connection with the dairy.
- VI. A small aerial concrete tank, to replace the unsightly drums previously used for supplying water, was erected at the Superintendent's residence.

G.—STAFF.

Mr. H. M. Peterkin, Agricultural Assistant, was promoted Junior Technical Assistant and assigned with duties in connection with Fertilizer Trials that are being conducted at this Station under the direction of the Agricultural Chemist.

Mr. L. W. Gray, a recent graduate of the Farm School, was appointed Agricultural Assistant.

I desire to record my appreciation of the support received from the various members of the Staff, and especially to Mr. T. P. Lecky the Stock Inspector, who has given invaluable services in connection with the inauguration and supervision of the Feed and Dairy Projects.

H.—GENERAL.

Despite the various additions during the year, there is still urgent need for further improvements and extension, particularly for an improved lighting system.

An Improvement Scheme over a five-year period has been submitted for consideration.

L. A. POWELL,
Actg. Agricultural Superintendent.
2.2.39.

(vii) Report of Senior Veterinary Officer.

ANIMAL HUSBANDRY.

The Department's activities consist of the operation and maintenance of the Stock Farm at Hope and the Stud Farm at Grove Place in Manchester and its field services among stock-breeders and small settlers in collaboration with the Jamaica Agricultural Society.

1. Government Stock Farm at Hope.—

The Government Stock Farm at Hope, inaugurated along with the Farm School in 1910 for education and demonstration in tropical dairying, still continues its useful work. It is the centre to which dairymen and other stock-breeders constantly resort for information and guidance in breeding and feeding operations, and has annually become more popular with large parties of country members of the Jamaica Agricultural Society and school children. Such parties are conducted over the Farm and shown the various breeds of cattle maintained, sanitary feeding and milking barns, the methods of clean milk production, dipping for tick control and disposal of manure, and other farm operations.

2. Stud Farm at Grove Place, Manchester.—

Similar work is carried on at Grove Place Stud Farm in Manchester, where horse, mule, ass, cattle and swine breeding is conducted in conjunction with large experimental plots devoted to citrus and smaller ones to bananas, maize, beans, peas, vegetables, cover crops, etc.

3. Public Cattle Stud Station at Hope.—

The Stock Farm at Hope established a Public Cattle Stud Station distinct from its own herd breeding operations in August, 1934. Since its inception 183 cows have been received at the Station: 83 to the Jersey bulls and 100 to the Guernsey bulls.

4. Sales of Bull Calves.—

For reasons of economy in its operation and to enable the public to acquire bulls at small initial cost for the improvement of their dairy cattle, the Farm regularly sells pure-bred and cross-bred bull calves when a few days old at 20/- to 60/- per head according to their breeding, for rearing on foster-mothers in the country. By this method dairy bulls are cheaply established throughout the Island and grow up well adapted to the conditions of their permanent environment. In the last 5 years (1934-38) 221 bull calves (chiefly grades) have been sold under this plan:—

- 95 Jerseys
- 64 Guernseys
- 48 Holstein-Friesian
- 3 Red Polls
- 1 Grade Montgomery
- 1 of uncertified breeding.

This policy is not practised at Grove Place because the dams in the herd are not in general as selectively bred as at Hope.

5. District Stud Bulls.—

The Department maintains a Montgomery-Jersey bull in St. Elizabeth for local stud purposes. This animal is moved from district to district as occasion or demand arises for his use.

This district service was started several years ago in St. Elizabeth by supplying a Montgomery-Red Poll Bull and moving him from district to district. Great difficulty was experienced at first in finding a reliable stud keeper. Towards the end of his career the bull was sold to a pen-keeper near Black River.

Subsequently, the Department extended a similar service to a portion of Westmoreland when a condensed milk factory in that parish was discussed. A grade Guernsey bull was furnished and loaned to small dairy properties and districts. The bull did not do well under these conditions of changing management and died after some ten months in the parish from arsenical poisoning—probably from a misuse of arsenical tick killing fluid.

In 1937 a grade Guernsey bull was stood at Llandewey in St. Thomas. After a few months' service he died of tick fever (*anaplasmosis*).

In spite of the failures mentioned, district stud bulls are certainly the best and cheapest means available for bringing about rapid improvement of the small settlers' cattle and demonstrating to them the value and importance of better sire. Such animals and their progeny may well be used at local centres for educational work in better breeding as well as feeding methods, because small settlers as a rule and even many of the large stock-keepers fail to realize that better bred or selectively bred stock need improved conditions of feed and management, if they are to be successful.

These remarks apply equally in respect of any efforts which may be launched for improving goats, swine or poultry.

6. Field Work in Animal Husbandry.—

Most of the divisional field work in animal husbandry proper during the year was done by Stock Inspector, T. P. Lecky. With Grove Place as headquarters he continued the work assigned him at that institution, namely development of a dairy herd and the study of feeding methods for dairy cattle, calves and pigs applicable to conditions in Manchester. In addition he kept in touch with owners on twenty-four cattle pens in and adjoining Manchester with the object of assisting them in respect of breeding and management problems as well as in the treatment and prevention of disease. In similar manner his services were extended by periodic or special visits to numerous small settlers in ten districts.

He assisted at Agricultural and Live Stock Shows at Nain (St. Elizabeth) and New Green (Manchester) and gave lectures on dairying and pig-rearing at six meetings of local branches of the Jamaica Agricultural Society.

His discussions on livestock subjects and the direct services rendered have been valuable and much appreciated.

In the last month of the year the Stock Inspector was transferred to St. Thomas in Ye Vale to do similar work in that area, but specially to stimulate an interest in dairying on the pens and among small settlers in view of the pending establishment of a milk condensary in that section of the Island in 1940.

This prescribed field work by the Stock Inspector was supplemented by interviews and correspondence with stock-breeders by the Senior Veterinary Officer and by visits to cattle breeding pens to advise on herd breeding policy, general management and the prevention or control of diseases.

During September (Sept. 18-23rd) the Senior Veterinary Officer assisted Mr. J. H. Dommen, Agent of the Nestle and Anglo-Swiss Milk Products Ltd., in his survey of the Island in connection with the establishment of a milk condensary in the Island. After completing the survey and deciding upon Bybrook in St. Thomas in the Vale as the site for the factory, Mr. Dommen reviewed the entire scheme in a meeting convened by the Jamaica Imperial Association on 26.10.38.

7. Marketing of Livestock.—

So far the Department has not taken any definite part in the marketing of animals or animal products, except to deal with enquiries for cattle from foreign sources and to aid buyers on their arrival in selecting breeds and individuals suitable for their purposes and conditions.

Domestic trade in livestock is done entirely by private treaty between owner and purchaser, generally on a valuation basis or estimated live weight in the case of butchers' stock. Where scales are available sales on actual weight are customary and on the increase. There are no regular livestock auction markets in the Island. Occasionally a dispersal sale on a property is by auction.

DISEASE CONTROL.

The year was singularly free of any extensive occurrences of acute infectious diseases, except swine fever and sporadic outbreaks of blackleg of cattle.

Anthrax.—Suspected outbreaks of anthrax were investigated but not confirmed at one sugar estate in St. James, three cattle pens and one small settlers' district in St. Elizabeth, one cattle pen in each of the parishes of Clarendon, St. Thomas and Portland.

Seasonal prophylactic vaccination was done by the Division on 915 cattle, 4 horses and 3 donkeys on six properties and in two small settlers' districts in areas which had a previous history of anthrax infection. In addition, the owners of several other cattle pens, where the disease has occurred in past years, annually vaccinate as a precautionary measure on the advice of the Department, and thereby assist materially in the reduction of possible outbreaks. It is desirable that the Department should undertake directly all such field operations, but it cannot with its present staff.

Foot and Mouth Disease.—(i) A suspected outbreak among cattle on a sugar estate in Westmoreland was immediately investigated and established to be excessive salivation with eruptions on the body and general muscular stiffness and bad condition associated with excessive indigestion of guavas, a fruit of high tannic acid content and constipating effect. None of the animals showed any lesions in the mouth or of the feet in the interdigital cleft or around the coronary band.

(ii) A disease of goats in district of Aleppo, St. Mary, reported as suspected foot and mouth disease, proved to be general emaciation with sores associated with internal parasites and lack of proper feeding.

Blackleg (Clostridium chauvei).—As previously reported this infection is widespread in the Island, especially in the moist hills, but is comparatively rare in the coastal areas.

Vaccination for its control is very generally practised by the bigger stockmen. On the smaller properties and in peasant areas vaccination is done by the Department, when possible, and by the Instructors of the Jamaica Agricultural Society.

In most cases the diagnosis of the disease is relatively easy, and owners, large and small, promptly burn or bury the carcasses and vaccinate for its control.

The Stock Inspector whilst at Grove Place diagnosed the disease on four properties and in one small settlers' district in Manchester, and vaccinated 315 young cattle on 8 properties and in one district in the course of his duties.

The Division further established outbreaks on two cattle pens and in one small settlers' area in St. Elizabeth and on one large pen in Clarendon, and assisted in having the cattle vaccinated.

Swine Fever (Hog Cholera).—The outbreak among garbage-fed hogs in the western outskirts of Kingston reported in the last quarter of 1937, continued its ravages and extended to several hog yards of

lower St. Andrew in spite of all attempts to limit its extension, because the hogs of these areas are not confined but range at large.

Persistent efforts were made to induce owners to protect their hogs against the infection by having them immunized by the serum-virus method furnished and administered free of charge, but with very few exceptions the offer was rejected and the disease regarded as a fatalistic occurrence. Accordingly it continued to spread with high mortality until the latter part of April.

Subsequent small outbreaks were discovered at Golden Spring, St. Andrew; Old Harbour Bay, St. Catherine; Johnston District in St. Thomas and near Annotto Bay, St. Mary. The origin of these outbreaks miles away from the infected area around Kingston was not established, but probably resulted from the transfer of hogs from the Kingston area.

Swine fever will always be a very difficult problem to deal with in Jamaica because garbage feeding is being increasingly practised around the towns, and in addition the hogs are in general not confined—circumstances conducive to its occurrence and rapid spread. Serum-virus immunization appears to be the only practical solution. Its application so far has been very limited because of the non-co-operation of owners and their lack of experience as to its efficacy.

Consequent upon Press articles regarding the outbreak around Kingston a succession of reports were received from various parts of the Island of suspected swine fever which upon investigation had no semblance to that disease. Reports of this nature were investigated at Stony Hill and Claremont near Bull Bay, St. Andrew; Pleasant Valley and Thatch Pen, Clarendon; Negril and Sheffield in Westmoreland and Yallahs, St. Thomas.

These and like reports are the general sequel to newspaper notices regarding outbreaks of animal diseases and, unless they are judiciously treated, cause confusion and interfere seriously with control measures. Owners get panicky and assume that any and every sickness of their stock is a case of the publicly noted disease.

Tick Fevers.—(i) Texas Fever (*Piroplasmosis bigeminum*) was diagnosed and assistance in treatment given on four cattle pens.

(ii) Gall-sickness (*Anaplasmosis*) was diagnosed and treated on three properties.

Navel or Joint-Ill in calves was dealt with on two pens.

Arsenical poisoning.—(Reported as anthrax) associated with the improper or careless use of sodium arsenite in the fluid of dipping tanks for tick control was investigated on three large cattle properties.

Poisonous plants.—The only pasture plant so far incriminated as frequently fatal to stock is *Urechites sub-erecta*, locally known as Jamaica nightshade. It is very generally distributed throughout the Island and with few exceptions permitted to remain and propagate itself in the pasture lands. It is becoming an increasing menace to livestock, especially cattle. Many reported occurrences of anthrax are in reality cases of poisoning by this plant.

Services in Public Works Department.

(i) During the year veterinary assistance was rendered on seven occasions at Halfway Tree (St. Andrew), twice at St. Ann's Bay, twice at Richmond and Lucky Hill (St. Mary), once at Annotto Bay (St. Mary), twice in Clarendon, and once at Falmouth (Trelawny) and Black River (St. Elizabeth).

(ii) Senior Veterinary Officer as a member of the Department's Horse and Mule Purchasing Committee visited twelve properties and assisted in the selection and purchase of sixty-two mules on a tour from 5th-9th July, 1938.

Veterinary Report: Government Stock Farm, Hope.

During 1938, the Farm had to contend with two long periods of drought (January-April and May-August) which reduced grazing to such an extent that all the stock on the Farm had to be fed from stored or reserve sources (silage and sugar cane mixed with concentrates) twice daily. Consequently milk output was materially reduced and labour charges (increased by 50%—75% as result of the labour disturbances in May-August) and other feeding costs enormously increased.

The major disease problems of the Farm are tuberculousis, infectious abortion with its sequel of sterility and gastro-intestinal troubles of pail-reared calves.

1. *Tuberculosis.*—Efforts to stamp out this infection in the dairy herd by means of improved stabling and feeding methods and appliances ensuring better sanitation supplemented by tuberculin testing, disinfection of stables and yards and watering troughs, have so far not eradicated, but beneficially affected the incidence of the disease.

As indicated below the percentage of positive reactors to the tuberculin test has been variable, and low since 1935.

The only test of 1938, made in co-operation with the Veterinary Officer of the Kingston and St. Andrew Corporation (October 25-28th), was of the cows in milk at the time (161 head), and resulted in discovery of one positive reactor and three suspects.

The reactor when killed showed a single old calcified lesion of the posterior mediastinal gland. The suspects were held for retest.

The animals classed as "suspects" are a problem in that some of them on retest, even by the double-intradermal method, prove negative, but on subsequent tests are positive reactors. A second disconcerting feature is failure in some positive reactors to discover gross lesions as illustrated in the autopsies of the 8 reactors of the two 1937 tests. Of these eight animals only two showed gross lesions when autopsied.

Record of Tuberculin Tests of Farm Cattle for 11 years, 1928-38.

Month of Test.	No. Tested.	Result.	Percentage Infection.
November, 1928	297 head	1 reactor	0.33%
October, 1929	342 "	1 reactor	0.29%
August and October, 1930	326 "	No reactors	Nil
December, 1931	348 "	1 reactor	0.28%
June, 1932	227 "	No reactors	Nil
June, 1933	293 "	No reactors	Nil
June, 1934	407 "	14 reactors	3.4%
November, 1934	401 "	7 reactors	1.74%
November, 1935	457 "	21 reactors	4.81%
April-May, 1936	445 "	No reactors	Nil
November, 1936	466 "	No reactors	Nil
March, 1937	139 "	4 reactors	0.8%
July-August, 1937	494 "	4 reactors	0.8%
October, 25-28th, 1938	161 "	1 reactor	..

2. Infectious Bovine Abortion (Bang's Disease).

The position in respect of this infection is about the same as in past years. Vaccination has been considered but not adopted, because it is not at all certain that it would materially improve conditions in the adult breeding cattle.

The results of experimental calf vaccination abroad using selected attenuated strains of the organism are being studied. Reports to date of well controlled tests are encouraging and indicate a definite improvement in vaccine therapy as applied to this disease. A policy of segregation based on periodic serum-agglutination tests is not practical at the Farm.

Parturition and Abortion Record, 1928-38.

Year.	Full Time Births.	Still Births.	Abortions.
1928	94	2	5
1929	81	2	8
1930	118	4	4
1931	126	..	9
1932	127	1	9
1933	144	4	7
1934	148	6	Nil
1935	158	3	4
1936	155	9 (5 premature twin births)	6
1937	161	4	11
1938	202	8	9

In the above table still-births at or about full-time parturition are not classed as abortions. Five of the eight still-births of 1938 resulted from difficult parturition, three from two twin births.

(ii) Sterility as a sequel or accompaniment of the disease makes it difficult to regulate the breeding programme of the herd, and entails annual drafting and sale of sterile animals. Twenty-one of the 32 cattle so drafted and sold in 1938 were sterile cows.

Manual ovarian treatment per rectum and repeated intramuscular injection of wheat germ oil, purporting to be rich in vitamin E content, produced no encouraging results.

3. Other Diseases and Ailments of the Farm Stock.

A. Adult and Semi-Adult animals.

Anaplasmosis and Actinomycosis.

1 case, Imported Red Poll Bull, "New Deal".

Digestive troubles:—

(i) Non-specific 7 cattle

(ii) Over feeding on mangoes 15 cattle

Genital conditions:—

(i) Prolapse of uterus 3 cows

(ii) Retention of foetal membranes 11 cows

(ii) Dystokia 5 cows

Garget 2 cows

Pneumonia 1 cow

Injuries from kicks, barbed wire and other

mechanical causes 1 horse, 3 mules, 31 cattle

Abscesses and sores 41 cattle

Choking from mangoes 1 cow

1 horse, 3 mules, 118 cattle

B. Calves.—Congenital weakness and gastro-intestinal disorders still account for most of the sickness and deaths in this group.

In addition to the carry-over of 1937, 194 calves (86 males, 108 females) born in 1938 were handled on the Farm. Seventy-two of the bull calves were sold for veal or for rearing when a few days old. The remainder (14 bull and 108 cow calves = 122 head) were kept and pail-fed on the Farm.

Of these 194 calves, 19 died or were destroyed: 5 on account of congenital weakness, 9 from gastro-intestinal disorders, 2 from pneumonia and 3 on account of marasmus.

Under the pail-feeding system most of the sickness among the calves is during their first 6-8 weeks of life.

It is extremely difficult to adequately feed and care 194 calves per annum, especially when tender grazing is not available as is the case during the months of drought at Hope.

It is therefore suggested that the present policy prohibiting the sale of young heifer calves be altered, and that fewer calves be reared on the Farm.

4. *Obituary List.*—

Horses and mules: none.

Cattle: 6 adults, 27 calves.

Calves.

8 still births.

5 congenital weakness.

9 gastro-intestinal disease.

2 pneumonia.

3 Marasmus.

Adults.

1. Imported Red Poll Bull, "New Deal" anaplasmosis.

2. Cow, Emily: Pneumonia.

3. Cow, Pergola: because of tuberculosis.

4. Cow, Liz: intestinal volvulus.

5. Native Red Poll, "Hope Theagenes 4th": barbed wire injuries.

6. Heifer, Pom Pom: accident in pasture.

Poultry.

Flock infections were sub-acute fowl cholera and contagious epithelioma.

To control the first the flock was twice vaccinated with hemorrhagic septicemia aggressin. A trial vaccination for contagious epithelioma was not successful in "takes," probably because most of the birds were immune from previous infection.

Five birds died from peritonitis associated with ruptured ovi-sacs, one from a large ovarian tumour, two from cardiac diseases, five from digestive troubles, one from fatty liver, one from abdominal dropsy, two from accidental causes, four from undetermined causes.

Total 3 cocks, 18 hens.

Veterinary Report: Grove Place Stud Farm.

1. The general health of the livestock during the year was good and weather conditions were favourable, except during the drought of the first three months of the year.

2. The cattle were twice vaccinated against anthrax during the year in view of the occurrence of that disease in sub-acute form in 1935.

3. The young cattle (2 years of age and under) are regularly protected against blackleg by vaccination because the soil of the Farm is known to be infected.

4. Psoroptic mange among the brood mares and mules has been effectively controlled by systematic use of lime-sulphur applications.

5. Tick infestation has been materially reduced, but will never be brought under complete control, so long as mares and cows from ticky properties are admitted to the stud. At present the policy is to warn prospective clients against sending ticky animals to the Farm and to dip them immediately after their arrival, but this procedure is not sufficiently effective to protect the Farm absolutely.

6. Twelve visits were made to the Farm during the year for inspections, vaccinations, destruction of superannuated stock and treatment of sick animals.

VETERINARY EDUCATION.

The Division's work consisted of the following:—

1. Lectures and demonstrations in Veterinary Science at the Government Farm School, Hope, during the three school terms of the year: 2 hours a week to each of the three classes.

2. Contributions to the discussions at Staff Conference (Jan. 10th-12th) on:—

(i) Stock improvement and animal health.

(ii) Stud services.

(iii) First aid work with animals.

3. Lectures and demonstrations at Grove Place and at meetings of Branch and Associated Branches of the Jamaica Agricultural Society and local Shows by the Stock Inspector on livestock judging, dairying and balanced rations for dairy cattle, rearing of calves by pail-feeding, pig-rearing and feeding and improvement of pastures.

4. Field demonstrations in the diagnosis of diseases in connection with investigations of suspected outbreaks of diseases, such as anthrax, blackleg, tick fever, swine fever, arsenical and urechites (nightshade) poisoning, fowl cholera, contagious epithelioma, etc.

STATISTICAL INFORMATION: LIVESTOCK INDUSTRY.

Island Livestock and Grazing Area.

(i) The following summary compiled from the Jamaica Handbook of 1937-38 supplemented by the Collector General's Report for 1937, gives the information available in respect of grazing pens and acreage, number of horsekind (horses, mules, asses), cattle (on pens and estates) and sheep in the Island. There are no figures for goats and swine—estimated figures are given.

Grazing Pens.	Grazing Acreage.	Horsekind.	Cattle.
554	326,368 acres.	10,340	130,823
Sheep.	Goats.	Swine.	
10,608	140,000 (estimated)	110,000 (estimated)	

(ii) There are no separate figures for the three classes of cattle reared in the Island, namely, beef, draft and dairy cattle. Estimated numbers are:—109,000 beef cattle, 15,000 draft cattle, 6,000 dairy cattle.

2. Domestic Meat Supply.

	Number.		
	1936.	1937.	1938.
Cattle slaughtered for beef	34,584	36,719	35,326
Value at £6 10s. a head (estimated)	£225,796	£238,673	£229,619

No accurate returns are available of sheep, goats or swine slaughtered.

3. Market Milk and Butter.—

The annual production of these two articles is estimated because figures are not available. Market milk production increased during 1938, but butter has steadily declined on account of the continued competition from foreign sources, chiefly New Zealand.

(Estimated Quantities and Values).

	1936.	1937.	1938.
	Gallons.	Gallons.	Gallons.
Market milk	730,000	730,000	800,000
at 1/- per gallon on the farm	£36,500	£36,500	£40,000
Butter	100,000 lbs.	100,000 lbs.	18,000 lbs.
at 1/2 per lb. on the farm	£6,415	£5,833	£1,050

4. Hides and Skins (exported)

	Number.			Value (c.i.f.)		
	1936.	1937.	1938.	1936.	1937.	1938
Hides	21,547	24,807	17,627	£11,322	£17,627	£5,107
Skins	231,551	183,042	172,922	£20,811	£22,109	£12,754
(Goatskins)						

5. Exports of Livestock.

Animal.	Number.	Origin.	Destination.	Remarks.
Horses.				
Racehorses	3	United Kingdom	United Kingdom	Re-exported.
Polo ponies	22	"	"	"
Polo ponies	7	Jamaica	"	
Thoroughbred				
Stallions	3	United Kingdom	U. S. A.	Re-exported.
Mares	1	Jamaica	"	
Racehorses	1	"	Haiti	
	37			
Asses				
Jacks	1	Jamaica	British Honduras	
	2	"	Costa Rica.	
	1	"	Panama	
	4			
Cattle.				
Aberdeen Angus bulls	1	Jamaica	Nassau	
	3	"	Panama	
Aberdeen Angus heifers	9	"	Panama	
Nellore bulls	2	"	Ecuador	
Grade Jersey bulls	2	"	Panama	
	17			
Dogs	1	Jamaica	Canada	
	1	"	Haiti	
	2			

6. *Imports of Livestock.*—

Horses—		
Racehorses	10	from United Kingdom
	3	„ U. S. A.
Ponies	1	„ Cayman Islands

14

Cattle—

Aberdeen Angus bulls	2	from Canada
Jersey bulls	2	„ U.S.A.
Grade Jersey bulls	2	„ Cayman Islands

6

Dogs—

Various breeds	34	from United Kingdom.
----------------	----	----------------------

7. *Poultry.*—

Importations of Baby Chicks by aeroplane, chiefly from Miami, Florida, U.S.A. started in 1932 and has continued annually since as below:—

1932.	1933.	1934.	1935.	1936.
A few lots	2,883	13,570 (91 lots)	16,016 (98 lots)	7,664 (74 lots)

1937.	1938.
13,339 (116 lots)	11,395 (94 lots)

(ii) Adult poultry in 1938:—

- 1 Jersey Giant cock
- 2 Black Minorca cocks
- 1 turkey cock and 2 hens.

(iii) The 1937 Trade Report shows the following importations of poultry and eggs:—

(a) Poultry and Game (for food) from—

British Honduras	..	..	£1	(c.i.f.)
United States of America	..	..	£23	„
Haiti	..	..	£61	„

£85

(b) Eggs (for food)

British West Indies	10,833 doz.	£145
Canada	4,322 “	£254
U. S. A.	10,207 “	£656
Haiti	7,811 “	£295
	33,283 doz.	£1,350

8. *Dipping Tanks on Register of Department.*—

1933.	1934.	1935.	1936.	1937.	1938.
368	372	376	379	384	387

Several of these are in bad order and inoperable.

(ii) Sales of Paranaph and Arnesenite of Soda by Government Laboratory for making the dipping fluid of the Tanks.

Lbs.	1933.	1934.	1935.	1936.	1937.	1938.
Paranaph	39,850	33,373	36,654	35,942	38,976	33,859
Arsenite of Soda	24,818	20,300	21,200	19,736	21,650	19,450

Many tanks are charged with Cooper's Perfect Cattle Dip in lieu of the Department's Paranaph and Arsenite of Soda mixture.

9. *Slaughter Houses.*—

Nine in the Island as follows:—

Parish.	No.	Location.
Kingston	1	West end of City
St. Andrew	1	Halfway Tree
St. Catherine	1	Spanish Town
Portland	1	Boundbrook, Port Antonio
St. Mary	2	Port Maria and Annotto Bay
St. Ann	1	St. Ann's Bay
Trelawny	1	Falmouth
St. James	1	Montego Bay.
St. Thomas	None	
Hanover	“	
St. Elizabeth	“	
Manchester	“	
Clarendon	“	

13 parishes

9 slaughter houses.

In general none of the animal bye-products are utilized at any of these establishment, except hides and skins. Some of the bones, horns and hoofs are collected for export usually to Germany and England.

S. LOCKETT,
Senior Veterinary Officer.
22.2.39.

Report on American Foul Brood Disease of Bees, 1938.

1. Government supervision of apiaries was maintained throughout the year and performed by Mr. Holon Heron, Instructor in Beekeeping of the Jamaica Agricultural Society.

2. Since the inception of the outbreak (officially as of November 13th, 1934) control measures have consisted of:— (i) periodic inspections of apiaries in Kingston and St. Andrew (the declared infected area) with special attention to infected apiaries and those in their immediate vicinity; (ii) prompt burning of all infected colonies, (iii) restriction of the movement of apiaries and appliances under a permit system.

3. During the period November 13, 1934—December 31, 1937, only 16 of the 119 apiaries registered in Kingston and St. Andrew showed infection (primary and recurrent) and in 1938 only one apiary (in Kingston) showed recurrent infection in one colony.

4. No infected apiaries have been discovered or reported outside of the declared infected area of Kingston and St. Andrew.

5. Registration of apiaries.

Area.	Year.	Apiarists.	Apiaries.	Estimated Colonies.
Kingston and St. Andrew ..	1935	97	126	3,279
	1936	93	109	3,370
	1937	98	119	3,657
	1938	111	138	3,727
Other parishes	1935	157	292	12,444
	1936	164	300	12,645
	1937	170	310	12,895
1938 (estimated same as 1937— no returns available)		170	310	12,895
Total (approximate for Island 1938)		281	448	16,622

The number of apiarists and apiaries is constantly changing because of sales, amalgamation of apiaries, etc. Similarly the number of colonies in the apiaries is subject to great seasonal fluctuation.

S. LOCKETT,
Senior Veterinary Officer.
22.2.39.

(viii) *Report of Forest Officer.*

1. INTRODUCTION.

This Report covers the first full year's working of the Forest Branch; though interrupted by administrative changes and labour unrest, considerable progress has been achieved. The lack of experienced personnel, particularly in the field staff, and the necessity for tackling every problem *ab initio*, has inevitably resulted in a lower standard of efficiency than would be expected from a long established service. The rapid expansion of the activities of the Branch during the year has emphasised the necessity for technical assistance if progress and a moderate degree of efficiency is to be maintained; while the complete absence of fundamental scientific data has been a great handicap in our efforts to base the work of the Branch on sound forestry principles.

During the year the policy and programme of the Branch was gradually crystallised and a comprehensive scheme for the development of the Forest Service was submitted to Government. The basic policy of the Branch may be re-stated as follows:

- (a) to develop measures of soil and water conservation and the prevention of erosion by
 - (i) the formation, re-afforestation and maintenance of Forest Reserves under public ownership and
 - (ii) the encouragement of protective measures on private lands.
- (b) to develop the local timber industry on conservative lines.

2. LEGISLATION.

Forest Law.—The Forest Law (No. 42 of 1937) was passed on December 29th, 1937, and was put into force in 1938. During the year, 28 persons were appointed Forest Officers under Section 3 of the Law, on August 30th, 1938, 18 Forest Reserves were gazetted under Section 4; Rules under Section 16 regulating the transit of timber and the registration of timber property marks were approved by the Governor in Privy Council on October 18th, 1938. The latter rules were not enforced during the year, pending printing and distribution. They are designed to regulate the transit of scheduled timber on public roads, etc., in order to control the stealing of timber both from private and Crown Lands; they also provide for the registration of property marks to be used by private persons on timber cut on Crown Lands.

Country Fires Law.—Assistance was given in the drafting of recommendations to revise the Country Fires Law and render it simpler and more effective. These recommendations were submitted to Government.

3. FOREST AREA.

Forest Area.—The following table is an estimation of the area, in acres, of forest lands of the island, as at December 31st, 1938:

Area of Jamaica.	Crown Land Forest.				Private Forests.	Total Forest Land.	Percentage of whole area.	
	Production Reserves.	Protection Reserves.	Un-reserved.	Total Crown Lands.			Forest Reserves.	Total Forest Land.
2,848,160	115,036	85,012	40,000	240,048	200,000	440,048	7%	15%

The area of private forest is estimated; according to taxation returns 647,000 acres of alienated lands are in wood or "ruinate,"* but it is doubtful if more than one-third of this represents true woodland.

Crown Lands.—The total area of Crown Lands is estimated to be 256,000 acres; of this approximately 8,000 acres are grass and reed swamps and 5,000 acres are rented to tenants. Representations were again made on the many undesirable features inherent in existing Crown Lands tenancy methods and most tenancy agreements are now submitted to the Forest Officer before final approval is given. The matter is, however, still far from satisfactory.

4. FOREST RESERVATION AND DEMARCATION.

Crown Lands.—On August 30th, the first forest reservations of Crown Lands under Section 4 of the Forest Law were gazetted. Eighteen blocks of forest ranging from 97 to 81,000 acres and totalling 197,636 acres have thus been provisionally reserved. These areas have been only in part defined and their final demarcation will inevitably take some time.

The reserves fall under two main categories, details of which are given in Appendix 2.

A. *Protection Reserves in the interior mountains.*—(82,600 acres, Map Nos. 2, 9, 32 and 33)—These are situated in the old Cretaceous and Eocene formations which form the backbone of the Island; the soils are derived mainly from shales, conglomerates and schists and are subject to extremely serious erosion. Altitude ranges from 3,000' - 7,000', slopes often exceed 45°, and rainfall is over 75" per annum. Included in this section are the Blue Mountains and the Bull Head Mountains where all available Crown Lands have been reserved; it will, however, be possible to release for agriculture certain areas of Crown Lands on the lower northern slopes of the Blue Mountains, as soon as demarcation of boundaries has been completed.

B. *Production Reserves on the white limestone*, (115,036 acres).—These are situated on the Oligocene white limestone which cover two-fifths of the Island; this group of reserves may be conveniently sub-divided into areas of high rainfall (88,353 acres) and of low rainfall (27,036 acres).

(i) *High rainfall areas.* (Map Nos. 6, 6a, b, c, g, 7, 8, 10, 18, 19, 20, 21).—This includes the Cockpit country of St. James and Trelawny and the Dry Harbour Mountains of Trelawny, St. Ann and Upper Clarendon. Rainfall ranges from 70" - 100" per annum. The country is in the main of the "cockpit" type, extensive areas of broken, rocky, limestone hillsides alternating with small glades where a little soil has accumulated. Reservations in these areas are provisional, and final settlement of boundaries awaits an agricultural survey, as there is no justification for reserving extensive areas on the limestone for protective purposes only. Areas suitable for permanent agricultural development are, however, limited.

(ii) *Low rainfall areas.* (Map Nos. 23 and 25).—This group includes the Healthshire Hills and Portland Ridge which lie on honeycomb limestone rock with very little soil and rainfall between 30" - 45" per annum; maximum elevation does not exceed 600', and the dry scrub growth contains very little timber, but may be developed into a useful fuel supply. The land is quite unsuited to any form of agriculture.

Land Settlement.—Close touch has been maintained with the Land Settlement Department in matters affecting land usage and combined inspections of properties have been carried out with a view to securing the optimum utilisation of land, either for agriculture or forestry. In addition to the reserves on land settlement mentioned in the report of the Forest Branch for 1937, other properties are being acquired jointly with the Land Settlement Department.

Water Commission Lands.—All lands in the Kingston Water Supply catchments vested in the Water Commission have been handed over to the Forest Branch for forest management. The estimated area of these lands has been included in figures given in Appendix 2, and surveys are being carried out to obtain accurate data.

War Department Lands.—All remaining War Department lands in the Blue Mountains, with the exception of the area actually occupied by the cantonments, have now been leased by the Forest Branch and are to be included in the Blue Mountain Forest Reserve. The additional area taken over during the year amounts to 307 acres; tenants ejected from this area are to be settled on Middleton property which has been purchased.

* Second growth.

Demarcation of boundaries.—The following table indicates the progress in demarcation of boundaries of Forest Reserves during the year:—

Reserve.	Length of boundary demarcated.	
	Miles.	Chains.
Blue Mountain ..	68	35
Kellets ..	6	15
Cockpit Country ..	8	73
Total	83	43

The most important work undertaken was that of demarcating the northern boundary of the Blue Mountain Reserve; for the most part this line runs through Crown Land and an attempt was made to lay down a boundary at approximately the 3,000' contour. It is proposed eventually to construct a bridle road mainly along the boundary, which has been graded with that end in view. The demarcation of Kellets Reserve, though in part surveyed some years ago, has not been completed owing to boundary disputes. A beginning was made in the large Cockpit Country Reserve by demarcating a boundary line adjoining private land and previously surveyed.

Demarcation consists of the billing out of Reserve boundary lines to varying widths, from 10' - 35', depending on the type of vegetation traversed; the greater widths also serve as fire lines. "Forest Reserve" sign plates are erected at all crossings of roads, bridle tracks, etc. The erection of concrete boundary pillars at corners and at intervals on the lines is carried out in conjunction with the surveys.

5. ACQUISITION OF LAND.

Acquisition of Land.—Seventeen properties totalling 2,412 acres were purchased for Forest Reserve during the year; of this amount 69 acres were acquired on denuded slopes of Bull Head Mountain and the remainder were in the Blue Mountains. Three properties totalling 1,367 acres in the Ginger River and Hermitage catchments were purchased on behalf of the Water Commission in order to protect the Kingston Water Supply. All these areas adjoin Forest Reserves and form valuable additions in zones particularly susceptible to erosion. A detailed statement is given in Appendix 3. Surveys and conveyances in respect of other properties were being carried out at the end of the year.

While there is a certain amount of woodland on some of these properties, there are extensive areas of grass and fern, which will require afforestation. A beginning was made with the planting of open areas on Mount Cressy.

6. SURVEYS.

Surveys.—During the year 49 miles of survey was carried out, mainly in connection with the acquisition of properties for Forest Reserves.

7. MAINTENANCE OF FOREST RESERVES.

Bridle Roads.—At the end of 1937, the Branch maintained 59 miles of bridle road, mainly in the Blue Mountains; during the year 19½ miles of roads serving tenanted sections of Crown Lands were written off, as they are now maintained by the Lands Department, and 4 miles 67 chains of new road were constructed. At December 31st, 1938, the total length of bridle road maintained thus amounted to 44 miles 63 chains. The standard bridle road has a width of 5' and a maximum gradient of 1.14.

Buildings.—Forest Guard's quarters were maintained and repaired at Quickstep and Rose Hill. In addition new quarters were constructed at Murdoch's Gap and Shooter's Hill. Patrol huts for senior officers were maintained at Hardware Gap and Shooter's Hill and a new hut was constructed at Murdoch's Gap; an old dwelling house at Cinchona was repaired to serve as an inspection hut for that zone. The difficulty of securing adequate quarters for the field staff is becoming a serious problem.

Boundary Lines.—As all known boundary lines were demarcated during the year, no subsequent maintenance was necessary.

Forest Offences.—As the Forest Law was only passed in December, 1937, it was decided not to prosecute except in flagrant cases, but to warn all offenders. Control of forest offences is gradually being secured and it is believed that large-scale lumber stealing is now becoming a thing of the past. The lack of a compounding clause in the Forest Law is being seriously felt. The following table indicates the number of offences reported:—

Category of Offence.	No. of Cases.	Action taken.
Larceny of timber ..	38	{ 10 offenders unknown 10 warned departmentally 18 taken to Court—1 fined, 5 acquitted, 12 pending.
Encroaching and squatting	10	Ejectment notices served
Cattle trespass ..	8	Cattle released on payment of pound fees.
Total	56	

Apart from the above, a large number of cases have been reported where trees had been cut prior to the Branch taking over control of the forests and these have not been included in the table.

Fires.—Eight fires were reported in Forest Reserves during the year. The total area burnt was approximately 30 acres, 28 acres of which was grass land; in view of the severity of the dry season, this is a gratifying record. The damage done was negligible.

Apart from fire lines cleared along reserve boundaries, all areas undergoing afforestation were systematically blocked off by fire traces, and no fire losses are recorded from these areas.

Working Plans.—No attempts have yet been made to put any Forests under Working Plans.

8. AFFORESTATION.

(a) **Kingston Water Supply Catchment.**—Afforestation of denuded areas in the catchment area of the Kingston Water Supply was continued at Shooter's Hill and Rose Hill between 3,000'–4,000' elevation. Weather conditions were most unfavourable for planting and rainfall was both deficient and badly distributed; considerable mortality was experienced in the 1937 blocks and it was necessary to reduce the area of new planting in order to provide plants for supplying blanks in the previous year's plantings. Approximately 96 acres of land was planted in comparison with 115 acres planted in 1937. Area figures are estimated as denuded areas are scattered and it has not yet been possible to survey accurately the actual areas planted.

The following were the principal species employed:—Mahoe (*Hibiscus elatus* Sw.), Cape Yacca* (*Podocarpus elongatus* L'Her.), Cedar (*Cedrela odorata* L.), Hong Kong Pine* (*Pinus massoniana* Lamb.), Bitter Damsel (*Simaruba glauca* DC.), Redwood (*Matayba apetala* Radlk.).

The following species were also planted experimentally in lesser quantities:—*Eucalyptus maculata* var. *citriodora* F. v. M.*, *Pittosporum undulatum**, Prickly Yellow (*Zanthoxylum martinicense* DC.), Red Bulletwood (*Dipholis nigra* Gr.) Breadnut (*Brosimum alicastrum* SW.), Akee* (*Blighia sapida*), Yellow Sanders (*Zanthoxylum* sp.) Jackfruit* (*Artocarpus integrifolia* L.) Hog Plum (*Spondias monbin* L.) Wild Tamarind (*Pithecolobium arboreum* Urb.), Honduras Mahogany* (*Swietenia macrophylla* King) Jamaican Mahogany (*S. mahagoni* L.) Locus (*Byrsonima coriacea* D.C.?).

The most promising species as regards survival is the Cape Yacca, seed of which is available in considerable quantities at Cinchona. The nurseries were badly affected by drought, and the number of plants available fell considerably below the estimated amount. The germination of Juniper Cedar (*Juniperus lucayana* Britton) was particularly disappointing, as out of 165 quarts of seed collected, a bare hundred or so germinated. The need for far more research on these and allied problems is again strongly emphasised.

It has been decided to close down further planting in the Rose Hill section of the Hermitage catchment as the worst of the denuded areas have now been planted. Nursery sites have, therefore, been selected at about 1,800' near the dam, with the intention of afforesting the lower levels now available.

(b) **Bull Head Mountain.**—In view of the difficulty of adequate supervision with the existing staff it was decided to undertake no further planting in this section, until the pressure of other work is relieved.

(c) **Liguanea Ridge.**—This denuded ridge behind the Botanical Gardens at Hope, at an elevation of approximately 800'–1,400' and with an average rainfall of 52" per annum, was selected for experimental planting; the object is to protect the water supplies for the Hope Farm and to use a certain number of ornamental trees for scenic purposes. The following species were used:—*Poinciana regia**, *Erythrina* sp.*, *Bauhinia monandra**, *B. purpurea**, *Hura crepitans*, *Albizia lebbek**, *Cassia siamea**, *Blighia sapida**, *Pithecolobium saman**, Approximately 5 acres were planted and 97 chains of fire trace were opened.

(d) **Palmetto Grove.**—A beginning was made in the afforestation of the Highgate Water Supply catchment at Palmetto Grove, but owing to difficulties of supervision and poor germination of seed only an acre was established. The species used were Teak (*Tectona grandis* L.) and Honduras Mahogany (*Swietenia macrophylla* King.).

Summary.—The following summary indicates the approximate acreage of plantations maintained, all work is intensive artificial regeneration of land not hitherto under forest of value.

Area of plantations on Jan. 1st, 1938	246 acres
Added during year	96

Total 342 acres

Cost of operations including tending, but exclusive of supervision charges £442

Crown Lands Forest Produce Rules.—Rules governing the issue of licences to extract forest produce from Crown Lands, and embodying classification of timbers and schedules of royalty rates, etc., were approved by the Government and put into force in February. After nearly a year's trial, the classification and royalty schedules are being drastically amended; the experience gained has been very valuable and should result in improved utilisation of the forest resources of Reserves.

Licences.—During the year 108 licences were issued under Crown Lands Forest Produce Rules of which 104 were for cutting timber and 4 for minor forest produce. The following table indicates the out-turn of timber and fuel from Crown Lands for the year ending December 31st, 1938:

*Exotic.

Category.	Local Measurement		Volume in cu. ft.	Conversion factor to cub. ft. (solid)	Equivalent in round timber cub. ft.	Conversion factor to round timber.	Total value In £
	Unit.	Quantity.					
Sawn	Ft. B.M.	137,000	11,416	12' B.M. per cu. ft.	17,124	1.5	2,055
Sleepers	number	9,392	27,976	3 cub. ft. per sleeper	55,952	2	4,696
Shingles	"	138,405	5,536	25 per cu. ft.	8,304	1.5	650
Roundwood	Poles	17,000	6,600	($\frac{1}{4}$) ²	6,600	1	425
Firewood	Cords 8'x4' x 4'	92	7,360	80 cub. ft. per cord	7,360	1	69
Total	..	..	58,888	..	95,340	..	7,895

Included in the above table are 8,000 cub. ft. of timber supplied free of charge to sufferers in the Portland floods. Outturn of minor forest produce was negligible.

The inexperience of field staff coupled with the peculiar habits of certain licensees, render it difficult to produce accurate statistics of utilisation, but it is hoped that in subsequent years, the data will be more reliable.

Census of Sawmills and primary forest industries.—At the request of the Secretary of State returns were prepared giving data of the Island's principal primary users of timber. Apart from small estate mills and re-saw mills in the towns, only one small milling unit is operating in Jamaica, and its output is very small and spasmodic.

Railway Sleepers for Jamaica Government Railway.—The Forest Officer served on a committee to investigate the whole problem of the supply of sleepers for the Government Railway. The enquiry revealed a number of interesting facts: there are approximately 560,000 sleepers (8' x 6" x 8") in the track and at present the average annual replacements are 40,000 per annum, and (together with 7,500 cub. ft. of switch and bridge timbers), the annual cost is approximately £20,000 per annum. All sleepers are of native hardwood and nearly 90% come from private lands.

It is significant that whereas present replacement figures indicate an average length of life of sleepers of 16 years, there are many sleepers now in service laid down 35 years ago; it is explained that 90% of sleepers replaced are only mechanically destroyed and not decayed (i.e., lack of notching has resulted in rail-spread and has necessitated excessive re-spiking) and that present maintenance methods will materially lengthen the average life of the timber. The price paid for a native Class 1 sleeper (10/-) compares favourably with that of the less durable imported creosoted sleepers (8/6 and 2/- to 3/- for sole plates). Comparative durability figures for the native hardwoods are difficult to assess on the data available, since bad track maintenance in the past has discounted some of the results.

The Committee was strongly opposed to departmental exploitation and supply of sleepers by the Forest Branch.

Imports and Exports of Wood Products.—Figures of the imports and exports of wood products are given in Appendix 4.

10. RESEARCH.

(a) *Botany and Ecology.*—A provisional check-list of the principal tree species of Jamaica was compiled, partly from Fawcett and Rendle's Flora (incomplete) and partly from herbarium records. The Forest Officer when on leave checked up the nomenclature of a number of species at the Natural History Museum. No attempt has been made to carry out systematic field collections, nor was it possible to undertake any ecological survey work.

(b) *Silviculture.*—During the course of afforestation activities data is being collected on the suitability of different species to the locality and on silvicultural methods, but the urgency of specific research on these problems is only too apparent.

(c) *Utilisation.*—Data is gradually being collected on the present uses of local timbers and valuable reports have been received from Agricultural Instructors of the Jamaica Agricultural Society on this subject.

Tan Barks.—A brief report was prepared on the local tanning industry; the poor quality of leather tanned with local materials and the use of immature specimens of economic timber trees of low tannin value indicates that it is desirable to introduce more suitable tan-bark trees. As Golden Wattle (*Acacia dealbata*) thrives at Cinchona it is believed that the other wattles of higher tannin content (*A. decurrens* and *A. molissima*) might grow well at the higher elevations. Seed has been ordered from South Africa and arrangements have been made with the Imperial Institute to undertake analyses of local tan barks.

Seasoning Shed.—A seasoning shed and small workshop were constructed at Hope, entirely of local timbers, and it is proposed to collect small quantities of all the principal Jamaican timbers for investigation and demonstration.

Termites.—The Government Entomologist has interested himself in termite control work and has produced a preliminary bulletin on the design of wooden buildings, choice of timber, preservation, and other aspects of control.

11. FINANCE.

The total expenditure of the Branch for the year ending December 31st, 1938, amounted to £6,239. Revenue for the same period amounted to £713, of which the sum of £150 was paid by the Water Commission as a contribution towards re-afforestation of the Kingston Water Supply catchments, and the remainder (£563) was received from timber sales.

Details of expenditure are given below:—

Annually recurrent—

Personal Emoluments	£2,709
Travelling, etc.	554
Other administrative charges	89
Research	18
Protection work (incl. afforestation.)	814
Miscellaneous	26

Total Annually recurrent £4,210

Special non-recurrent—

Equipment	£277
Buildings	290
Acquisition of Land	769
Surveys and demarcation	793

Total, non-recurrent 2,029

Grand Total £6,239

In addition to the above, the sum of £3,879 10s. 7d. provided by the Water Commission was expended in acquisition of land for protection of catchments.

The following table indicates the revenue and expenditure on forest operations since 1931, prior to which no data are available:—

Year.	1931	1932	1933	1934	1935	1936	1937	1938
Revenue (£) ..	188	36	152	130	195	243	194	713
Expenditure (£)	1,066	871	888	897	835	998	1,929	6,239

12. ADMINISTRATION.

General.—On April 1st, 1938, the Forest Branch was transferred to the Department of Science and Agriculture and was provided with temporary accommodation at the Head Office. In December the Forest Office was moved to Hope Lodge, where it was possible to begin organization of office work under more satisfactory conditions.

Staff.—The strength of the forest staff on December 31st, 1938 was as follows:—

Senior Staff:

- 1 Forest Officer (Colonial Forest Service)
- 1 Forest Settlement Officer
- 1 Forest Surveyor (temporary).

Field Staff:

- 8 Forest Guards
- 8 Forest Watchers

Clerical Staff:

- 1 Typist and Stenographer.

Staff Changes.—The following staff changes took place during the year:—

Officer.	Post.	Remarks.
C. Swabey	Forest Officer ..	On leave 28.6.38 to 15.11.38.
E. M. Brown	Forest Settlement Officer	Ag. Forest Officer, 28.6.38-15.11.38
L. H. Myers	Temporary Surveyor ..	Appointed 16.5.38
L. V. Burns	Forest Guard ..	Ag. Forest Settlement Officer, 28.6.—30.9.38 and 15.10.—15.11.38
E. Edwards ..	do. ..	Ag. Forest Settlement Officer 1.10.38 to 14.10.38
I. Scott ..	Forest Watcher ..	Dismissed 31.5.38
C. Talbott ..	do. ..	Resigned 15.10.38
H. Coote ..	do. ..	Dismissed 31.12.38
J. Dalmage ..	do. ..	Dismissed 31.12.38
C. Clarke ..	do. ..	Appointed 20.6.38, dismissed 31.12.38
G. Alexander	do. ..	Appointed 16.10.38
Miss P. Foster	Clerical Assistant ..	Transferred to Lands Dept. 1.4.38
Miss P. Alexander	Typist and Stenographer	Appointed 1.4.38

A short training course was held at Hope in February for all Forest Guards and Watchers, but the complete inexperience of the bulk of these officers is still a very serious handicap to adequate management of the Reserves. The necessity for replacing during the year one-third of the field staff originally recruited has also been upsetting to efficient organization.

Crown Lands Administration.—The weakness of the system of dual control of Crown Lands by the Lands Department and the Forest Branch became increasingly apparent. Pending reorganization of the Lands Department, no active measures to remedy the situation were taken during the year, but the matter is receiving close attention.

13. GENERAL.

Erosion.—The Forest Officer collaborated with the Agricultural Chemist in the preparation of a report on "Soil Erosion and Conservation in Jamaica," which was published as Bulletin No. 17 of the Department. Assistance was also given in the establishment of leguminous cover crops, etc., in experimental areas in the Blue Mountain Reserve.

Flood damage in Portland.—Two Forest Guards were seconded for duty in Portland for varying periods to supervise the cutting and supply of timber from Crown Lands for the rebuilding of houses destroyed in the floods of November, 1937. Over 17,000 round wood timbers for sills, uprights, wall plates, etc., were cut and extracted, together with 17,000' B.M. of cedar boards. This represents approximately 8,000 cu. ft. of timber supplied free, for the reconstruction of 150 houses.

Weather.—Rainfall in planting areas was most unsatisfactory; prolonged dry weather in the early months of the year was followed by a further dry spell in October and November. This resulted, not only in heavy mortality in nurseries and young plantations, but in the disorganization of normal planting periods.

Wild Life Protection.—The Forest Officer was appointed to serve on a committee to consider questions of bird preservation; recommendations for the establishment of bird sanctuaries and for revision of existing legislation were put forward.

Exchanges of Seed.—Thanks are due to the following for kindly supplying seed for experimental purposes—Queensland Forest Service (*Eucalyptus eloeziana*, *E. paniculata*, *F. maculata*, *E. pilularis*, *E. microcorys*, *Syncarpia laurifolia*). Silviculturist, Burma: (*Trema amboinensis*). Soil Conservation Service, U.S.A. (*Pinus caribaea*, *Pueraria thunbergiana*).

Seed of mahoe and cedar was supplied to the Forest Department, Trinidad.

Labour.—The labour unrest of late May, though it did not affect the forest labour directly, has resulted in general wage increases, which are of course reflected in increased costs of forest operations. The loyalty and hard work of the regular labourers have been highly commendable during a trying period.

Royal Commission.—Statements were prepared and evidence was given to the Royal Commission in November, regarding the policy and activities of the Branch.

Maroons.—The cutting of railway sleepers on Crown Lands adjoining the Accompong Maroon settlement brought to a head a long-standing argument as to the boundaries of the Maroon lands and surveys were in progress at the end of the year.

Acknowledgments.—The rapid expansion of the activities and responsibilities of the Branch has placed a severe strain on the staff and I must place on record an appreciation of the spirit in which the many difficulties have been met.

Acknowledgment is made to the Crown Solicitor and his staff and to the Surveyor General for much assistance readily given.

C. SWABEY,
Forest Officer.

APPENDIX I.

Glossary.

Ebony	..	<i>Brya ebenus</i> DC.
Lignum vitæ	..	<i>Guaiacum officinale</i> L.
Lancewood	..	<i>Oxandra lanceolata</i> Sw. (Baill.)
Mahogany	..	<i>Swietenia mahagoni</i> L.
Satinwood	..	<i>Zanthoxylum flavum</i> Vahl
Amyriswood	..	<i>Amyris balsamifera</i> L.
Sandalwood	..	do. do.
Yacca	..	<i>Podocarpus urbanii</i> Pilger
Divi-divi	..	<i>Caesalpinia coriaria</i> Willd.
Fustic	..	<i>Chlorophora tinctoria</i> L.
Logwood	..	<i>Haematoxylon campechianum</i> L.
Bitterwood	}	<i>Picraena excelsa</i> Lindl.
Quassia	}	

Wage rates prior to June ranged from 2/- to 2/6 for men and 1/- to 1/6 for women and boys. Since then the rates for men have been increased to 3/- per day.

Progress in Forest Reservation and Demarcation.

Map No.	Name of Reserve.	Reserves approved but not legally constituted.			Reserves constituted but not completely demarcated.				Reserves constituted and demarcated.			Grand Total	
		On Jan. 1, 1938	Added during year	On Dec. 31, 1938	On Jan. 1, 1938	Added during year	Excluded or transferred to Col. Secy.	On Dec. 31, 1938.	On Jan. 1, 1938.	Added during year.	Excluded during year.		On Dec. 31, 1938.
<i>Protection Reserves:</i>													
2	Dolphin Head	..	..	..	300	..	..	300	..	..	..	300	
9	Bull Head	..	69*	69	700	..	..	700	..	..	..	769	
32	Blue Mountains	..	2,343*	2,343	81,000	..	..	81,000	..	..	..	83,343	
33	Haycock Hill	..	..	..	600	..	..	600	..	..	..	600	
	Total	..	2,412*	2,412	82,600	..	..	82,600	..	..	..	85,012	
<i>Production Reserves:</i>													
3	Burnt Savanna	..	..	..	51,000	..	..	51,000	..	97	97	97	
6 & 6a	Cockpit Country	..	..	..	1,300	..	..	1,300	..	..	..	51,000	
6h	Ruthven	..	..	..	1,350	..	..	1,350	..	..	..	1,300	
6c	Shama	..	..	..	600	..	..	600	..	..	..	1,350	
6e	Discovery	..	..	..	12,500	..	..	12,500	..	..	..	600	
7	Dry Harbour Mts. West	..	..	..	14,200	..	..	14,200	..	..	..	12,500	
8	Dry Harbour Mts. East	..	..	..	1,500	..	..	1,500	..	..	..	14,200	
10	Kellets	..	..	..	3,000	..	..	3,000	..	..	..	1,500	
18	Ballintoy	..	..	..	1,600	..	..	1,600	..	..	..	3,000	
19	Camperdown	..	..	..	720	..	..	720	..	..	..	1,600	
20	St. Faith	..	..	..	..	..	..	..	..	150	150	720	
21	Charlton	..	..	..	7,700	..	..	7,700	..	..	..	150	
23	Portland Ridge	..	..	..	19,319	..	..	19,319	..	..	..	7,700	
25	Heathshire Hills	..	..	..	..	..	..	..	..	..	..	19,319	
	Total	..	..	..	114,789	..	..	114,789	..	247	247	115,036	
	Grand Total	..	2,412*	2,412	197,389	..	..	197,389	..	247	247	200,048	

* By purchase.

APPENDIX 3.

*Lands acquired for Forest Reserve.**(A) From Forest Branch Funds:*

Reserve.	Property.	Area A.R.P.	Vendor.	Total Area A.R.P.
Blue Mountain	Green Hills	1.0.25	F. Teape	75.0.13
Do.	do.	9.2.38	G. Tyrell	
Do.	do.	12.3.02	T. J. Guilfoyle	
Do.	do.	24.1.35	Dr. Richardson	
Do.	do.	17.2.25	F. G. Joy	
Do.	do.	3.08	A. Campbell	
Do.	do.	1.3.05	I. McLarty	
Do.	do.	2.0.30	J. Christie	
Do.	do.	1.2.37	J. Campbell	
Do.	do.	2.3.08	A. Campbell	
Do.	Portland Gap	900.0.00	R. Stott	900.0.00
Bull Head	Industry	16.2.27	R. Robotham	68.3.03
Do.	do.	39.2.13	S. T. Sharpe	
Do.	Do.	12.2.03	J. C. Newell	
Total Forest Branch Funds				1,043.3.16
<i>(B) From Water Commission Funds:</i>				1,367.2.35
Blue Mountain	Mt. Cressy	567.2.35	J. Anderson	
Do.	Tweedside	500.0.00	G. W. Gox	
	Whitfield Pt.	300.0.00	G. W. Cox	
Total Water Commission Funds				1,367.2.35
Grand Total				2,411.2.11

IMPORTS AND EXPORTS OF TIMBER AND FOREST

Category.	Gross Imports.		Gross Exports.	
	Hundreds of cu. ft.	Value in £	Hundreds of cu. ft.	Value in £
Timber—				
Sawn:				
Douglas Fir	2,340	26,593	..	..
Pitch Pine	10,944	122,075	..	..
White Pine	101	1,519	..	..
Unenumerated	93	1,971	9	191
Roundwood:				
Ebony	..	..	5	52
Lignum vitae	..	..	118	847
Total Timber	13,478	152,158	132	1,090
Shingles—				
Cypress	..	744	..	..
Cedar and Other	..	3,039	..	..
Other Splitwood:				
Hoops, shooks, staves	..	108,392	..	..
Wood Products:				
Wall boards	..	..	..	..
Matches	..	343	..	..
Paper and Pulp products	..	130,799	..	..
Other cellulose products	..	132,104	..	..
Furniture	..	19,634	..	..
Other wooden ware	..	14,030	..	..
Minor Forest Products:				
Drugs, spices	..	..	..	3,875
Gums—resins	..	1,233	..	..
Incense and perfume woods	..	..	..	107
Tan Stuffs and Dye Stuffs:				
Divi-divi	..	..	..	649
Barks	..	..	..	121
Fustic	..	..	..	1,506
Logwood	..	..	..	14,239
Extract (Logwood)	..	..	..	50,677
Miscellaneous	..	2,954	..	..
Total Other Forest Produce	..	413,272	..	71,174
Grand Total	..	565,430	..	72,264

DIX 4.

PRODUCE DURING YEAR ENDED DECEMBER 31ST, 1938.

Net Imports or Exports.		Average annual net imports or exports for quinquennium ending 31st Dec., 1937.		Percentage value of gross imports or exports from or to different sources or destinations during the year.
Hundreds of cu. ft.	Value in £	Hundreds of cu. ft.	Value in £	
2,340	26,593	1,050	7,301	Canada 100%
10,944	122,075	13,275	115,516	Bahamas 7%, U.S.A. 93%.
101	1,519	123	1,300	Canada 100%
84	1,780	151	2,511	Canada 40%, U.S.A. 29%, British Guiana 22%. Other countries 9%, U.K. 94%, Bermuda 6%.
5	52	35	336	U.K. 100%.
118	847	114	1,010	U.K. 48%, France 22%, Germany 16%, Other countries 14%.
13,346	151,068	14,450	125,282	
..	744	..	1,402	U.S.A. 100%
..	3,039	..	4,099	U.S.A. 9%, Canada 91%
..	108,392	..	45,153	U.S.A. 77%, Canada 18%, Germany 4%, U.K. 1%.
..	..	..	1,057	
..	343	..	1,590	Sweden 77%, U.K. 20%, U.S.A. 3%.
..	130,799	..	98,562	U.S.A. 24%, Canada 24%, U.K. 21%
..	132,104	..	103,645	Holland 11%, Others 20%.
..	19,634	..	13,928	U.K. 27%, Italy 12%, U.S.A. 1%
..	..	..	10,999	Japan 10%, Canada 10%, China 7%
..	3,875	..	5,583	Others 23%—(Art if silk)
..	1,233	..	2,796	U.K. 29%, Canada 21%, U.S.A. 17%
..	107	..	231	Germany 11%, Sweden 9%, Poland 6%
..	649	..	769	Others 7%.
..	121	..	257	U.S.A. 35%, Sweden 12%, U.K. 10%
..	1,506	..	4,642	Finland 9%, Germany 8%, Canada 6%, Italy 6%, Others 14%.
..	14,239	..	45,510	Italy 44%, France 26%, U.S.A. 17%
..	50,677	..	83,592	(Bitterwood Quassia) U.K. 9%, Holland 4%.
..	2,954	..	3,513	U.S.A. 95%, U.K. 5%.
				U.K. 100%—(Sandalwood, Amyris wood,)
				U.K. 72%, Germany 25%, Haiti 3%.
				U.K. 25%, U.S.A. 28%, France 24%, Germany 23%.
				U.S.A. 42%, France 38%, Germany 17%, U.K. 3%.
				France 85%, U.S.A. 14%, U.K. 1%.
				U.K. 93%, Belgium 3%, U.S.A. 2%, Others 2%.
				Spain 42%, Portugal 20%, U.K. 18%, U.S.A. 20%.
	342,098	..	427,328	
	493,166	..	552,610	

(ix) *Report of Supervising Inspector of Plant Diseases.*

I beg to submit my Report for year ending December, 1938:

1. Supervision of Inspectors' districts was maintained throughout the year. Inspector N. A. Wainwright after 15 years of faithful service, resigned his position and Mr. Ivan Tomlinson, Foreman of the Hope Experiment Station, was promoted to the position of Inspector. Inspector Bewley was transferred from his district to that of Inspector Wainwright and Inspector Tomlinson took charge of his district. In August, Inspector McHardy, one of our most hardworking and reliable Inspectors, was promoted to the position of Senior Overseer in the Lands Department.

2. In April, the Instructors of the Agricultural Society co-operated with the Department and a combined force was formed for a Banana Improvement Campaign. The Island was divided into four districts under the charge of Messrs. Hanson, Bacquie, Glen Campbell and McHardy. I was responsible for the whole Island, reporting direct to the Plant Pathologist and Director of Agriculture. The forms of work carried out by both Inspectors and Instructors were general tillage, manuring and dusting for Leaf Spot. Some three hundred acres were brought under cultivation. Every officer co-operated with zeal and ability for the furtherance of this project. The demonstration plots were in the majority of cases outstanding until November when a most severe attack of Leaf Spot occurred, destroying most of the good work accomplished.

3. The work on Panama Disease treatment was carried out as usual. This disease appeared to an alarming extent from April to July and again from September to December. There is much delay in treatment by owners, thus every Inspector had to employ more labourers for carrying out treatment of neglected cases. Many areas which suffered heavily from Leaf Spot and Panama Diseases had to be left untreated.

Citrus.—The citrus nurseries at Caymanas and Tamarinds supplied the full quota of plants required. 30,000 budded plants were prepared for distribution by the Agricultural Officer. Owing to the fact that both these nurseries have been replanted a second time, it was thought best to secure new lands. A site was obtained from the Prisons Department and a large nursery has also been established at Charlton, the Land Settlement property near Ewarton. The Caymanas nursery will be abandoned. I must record sincere gratitude for the assistance given the Department by the owner and manager of the Caymanas Estates for the past four years.

There are now growing on new lands at the Prison some 30,000 Sour Orange seedlings. These are being cultivated by prisoners and will soon be ready for budding.

The Charlton nursery is divided into two parts. The Citrus nursery has now 11,000 budding plants which will be ready for distribution this year. There are also 100,000 Sour Orange seedlings now being budded for supplying early next year. Another nursery supply of 300 quarts of seed has been sown for the continuation of the campaign.

Section 2 of the Charlton Nurseries, supported under a working account with the Lands Department is being carried out for the supplying of economic plants and healthy banana suckers free of Panama Disease to purchasers on the Settlement Area. The returns from this nursery for plants and fruits sold make it almost self-supporting. The following is a list of plants distributed from this nursery from August, 1937 to December, 1938:—

Bananas	..	..	26,925
Annatto plants	..	..	25,700
Canes	..	..	38,450 (tops)
Cassava	..	..	6,400
Potato	..	..	28,850 (slips)
Coffee	..	..	350
Cocoa	..	..	1,025
Avocado Pears	..	..	257
Guatemala Grass	..	..	2,050
Sour Orange	..	..	8,000 (seedlings).

Mango Budding on the Liguanea Plains.—The campaign started in August, 1936. The total budded for this year is 755 trees containing 2,270 buds. The number of trees budded and the number of buds growing for the period are as follows:—

Year.	No. of Trees.	No. of Buds.
1936	1,480	3,057
1937	2,304	10,916
1938	755	2,270
	4,537	16,243

It is very pleasing to record that many of the trees budded in 1936 are bearing fruit this season.

Avocado Pears.—An orchard of the imported pears is being established at Charlton. Buds from the seven varieties were taken from Hope and inserted upon seedlings. Four varieties were taken to Crawle and some fifty trees were top-worked. These trees are growing luxuriantly.

Cayenne Pineapples.—The 500 plants imported from Fiji in December, 1935, have been well cared for and are being multiplied successfully.

J. B. SUTHERLAND,
Supervising Inspector of Plant Diseases.

Report of Agricultural Officer.

The extension work in citrus forms the chief item of work, except that since August, 1938, there has been added the care of the Citrus Manurial Plot at Wakefield which was planted in that month.

A.—FIELD WORK.

1. Work in the field has, as in the past, been largely confined to citrus.
2. *Nurseries*.—The nurseries at Caymanas and at the Prisons began again to yield plants for distribution which has been carried out from the opening of the year as conditions would admit, all the digging and distributing being carefully supervised. At the former nursery no extension is being undertaken. At the Prisons a further area of approximately 2 acres was completed during the year using stocks grown at the Experimental Station at Hope. These will in all probability be available for budding in the Spring. Assistance was also rendered in planting a large extension at Charlton Nursery at Ewarton.
3. The distribution of plants which had been considerably reduced in the previous year, approached what might be considered normalcy until drought conditions checked further work in this direction. A total of nearly 25,000 plants were distributed. From August, 1934 to December, 1938 the total distributions are 95,713.
4. The work of instruction has been maintained throughout the period, beginning, as usual with a visit to as many groves as possible prior to the early spring. Advice is given on such operations as pruning, spraying, cultivation, etc., with a view to obtaining the best results in growth and in insect control.
5. Many of the fields which had made great promise up to last year have recently been somewhat neglected due to the depressing reports appearing in the press on the future of citrus. Some have restarted again following my visits of encouragement, but there is still a feeling of uncertainty in the air. The fields in the Blue Mountains mentioned in the previous year's report have not maintained their standard and are now losing ground.
6. It has been found in practice to be essential to follow up the early advisory work in fields year after year, although many of the planters have had sufficient demonstrative education to fit them to understand the requirements of the crop. One of the greatest difficulties is experienced in persuading the majority to maintain a clean circle round the tree and a clear exposed crown-root system. Our method of planting on mounds usually ensures the exposure of the main roots for the first year, but being accustomed to earthing up their other crops the tendency always is to do the same with citrus, generally with disastrous results. Grubs of the Fiddler beetle (*Prepodes vittatus*) have been very destructive wherever this rule has been violated.
7. During this year fruit has begun to appear in most fields in varying quantities. In some districts it has been necessary to assist in the disposal of the crops some times too small to attract buyers for packing houses. As the medium for bringing growers into touch with shippers a measure of success has been achieved. Most of the crop which was immature until late in the season, has not yet been sold. As the trees develop every effort should be made to induce, if possible, the early maturity of a large portion of the crop to meet the period of ready sale at good prices.
8. The best yield has been obtained on a grove planted in August to September, 1934. Of 620 trees from the Caymanas Nursery planted in one section of this estate a crop of 1,100 boxes were reaped up to December and there is still a balance of 150 or more boxes on the trees. An average of two boxes per tree (with some trees yielding 4–5 boxes each) in 4½ years appears to be extraordinary in this country where so little effort is expended on forcing growth in early years. There are other places where certain young trees of similar age are well-grown but the evenness of development shown in the above-mentioned grove is not manifest. Never-the-less fruiting has started in most of the plantings over 4 years old. Valencia oranges of a good standard are to be found in heavy clay soils, and in elevation districts the colour bids fair to rival the California product.
9. The movement towards citrus growing in St. Ann is especially encouraging in the Pedro area where one planter in particular is very keen on establishing an orange grove. He is a very careful planter and his results so far are distinctly promising. Of 2,228 plants transplanted between June and October, all but 9 are in very good order. Other new plantings in this parish are also quite promising, and the older cultivations adversely commented upon in the last report, have now made a decided change for the better.
10. In St. Catherine the very marked advance is on the part of some new plantings to the extent of over 5,000 plants. Planters with older fields have also extended to approximately one-half of that number. There is much to be done in this parish in the way of development there being many districts not far distant from good centres highly suitable for the production of citrus fruit of good quality.

INTERPLANTING.

11. The planting of other crops in the citrus groves has continued to be one of the planks in our propaganda. It apparently is essential to such an industry in Jamaica where the hope of return from the major crop is so long deferred. As previously mentioned any introduction of banana into the planting programme immediately assures good cultivation for the citrus and in windy areas provides a form of wind-break. In one instance on a hill-side slope where wind was hindering the growth of young trees and had been interplanted with undoubted benefit to the citrus. In some cases the greatest drawback to these inter-plantings is the delay in the removal of the shade or shelter at the right time. Potatoes (Irish) have greatly assisted in the cultivation of the land with obvious benefit.

DEMONSTRATION PLOTS.

12. These plots are co-operatively developed by the owner of the property and the Department, the latter furnishing plants and instructions while the owner gives the land and labour. Most of these are useful for demonstration and experimental purposes. The first of these established at Berridge near Fellowship in Portland, as reported last year, was washed by flood rains which did serious damage and the plot is now abandoned.
13. Fruiting has commenced on those at Trelington, Highgate and Llandewey, the trees being generally quite well grown.

CITRUS DEVELOPMENT LOAN SCHEME.

14. There have been added during this year 118 acres making a total of 368 acres the oldest grove being 3 years and beginning to fruit quite nicely.

DISTRIBUTION OF PLANTS.

15. A survey of the distribution of plants in the parishes has revealed the fact that St. Catherine has taken the lead with 9,241 plants (of which 1,407 were supplied to Experimental Demonstration Plots) with St. Ann, formerly a backward parish, taking the second place with 4,233 followed by Clarendon and Manchester with 4,119, and 3,494 respectively. Of the total of 24,933 plants 15,588 were Valencia Oranges and 8,519 grapefruit. The remainder of 885 plants distributed during the year consists of T.1 limes, West India limes, and Perrine all on sour orange stock. The last named being distributed free for testing in various districts.

MEETINGS.

16. Meetings attended were the Staff Conference at the Farm School, January 10, 11 and 12 and the Half-yearly General Meeting of the Jamaica Agricultural Society on January 13th.

MISCELLANEOUS.

17. In August of this year I was appointed to act as Agricultural Superintendent in view of Mr. Martinez secondment to the Lands Department. As a result field operations in connection with the Citrus Manorial Plot at Wakefield have been placed under my charge. The plot was planted in August to September with 1,117 Marsh Seedless Grapefruit and 100 Valencia Oranges which are in good order.

18. The assistance of the Superintendent of Prisons, St. Catherine, and his staff has been as usual much appreciated.

19. The Agricultural Society's field staff and our Inspectors of Plant Diseases have continued to render help in the planting and care of the distributions from our nurseries.

Distribution of Varieties.

Grapefruit:			
Marsh Seedless	..	8,519	
Thompson Pink	..	1	8,520
Orange:			
Valencia, Isleworth	..	5,767	
" Reasoner	..	8,636	
Lue Gim Gong	..	1,145	
Surprise Navel	..	17	
Hamlin	..	3	
Temple Orange	..	1	
Thornton Tangelo	..	1	
Lake Tangelo	..	16	
Oranguma	..	1	
Oneca	..	1	15,588
Limes and Lemons:			
T.1 Limes	..	141	
West India	..	464	
Villa Franca Lemon	..	15	
Perrine	..	265	885
Total for 1938			24,993
Former Total			70,720
Total to date			95,713

Distribution in Parishes.

St. Mary	..	2,415
Manchester	..	3,494
St. Catherine	..	9,241
Clarendon	..	4,119
Portland	..	25
St. Andrew	..	401
St. Ann	..	4,233
St. James	..	343
St. Thomas	..	287
Trelawny	..	32
St. Elizabeth	..	152
Westmoreland	..	150
Hanover	..	95
Kingston	..	6
		24,993

L. L. CARRINGTON,
Agricultural Officer.

(xi) *Report of Tobacco Specialist, 1938.*

Experimental Plots.—The crop planted in 1937 was completely harvested by the end of January, and from the plots at Hope, Temple Hall and Constant Spring, which were 2 acres each, 4,352 lbs. gross weight of cigar tobaccos were produced, of which 3,525 lbs. were shipped to England, and over 400 lbs. were sold locally as "tonque" tobacco to small dealers for mixing in with their *Jacks* ripe tobacco. The crop was not so good as last year, and the nett weights from the plots were as follows:—Hope 817 lbs. per acre, Constant Spring 750 lbs. per acre and Temple Hall 358 lbs. per acre. Temple Hall suffered from too much rain, and much trouble was experienced in the air-curing as it was found almost impossible to keep the air sufficiently dry to prevent fungus forming on the leaves in the barn.

Three types of Puerto Rican tobacco were again tried out, also a Sumatra wrapper type, a Manilla type and 2 Havana types. The Manilla type was very poor in quality, though the growth of the plants was good. The Havana and Sumatra types did well at Hope, and there was some very good tobacco at Constant Spring from the UX and S30 types of Puerto Rican, but these leaves tend to grow narrow in the case of the UX and too coarse in the S30. The Sumatra plants gave very fine leaves, which were sent to England as samples of wrapper, and well received as such. The small plot at Lititz in St. Elizabeth was a failure, as the suckers were planted out too late and missed the rain, and as water is scarce it was quite impossible to irrigate or water the plants. However, sufficient tobacco of the UX and Havana type was produced to show what quality is to be expected in that district.

2. From the 9 plots of Virginia leaf as much as possible was harvested and brought to the flue-barn at Constant Spring for curing. This privately owned flue-barn was rough in structure, but served the purpose and sufficient tobacco was cured well enough to form samples for shipment to England. The Tobacco Specialist was able to see many manufacturers and importers and show them these samples when he was in England last September, and was informed that many of these samples were very like South Carolina tobacco, and that they were quite saleable. The samples from Grove Place, Hope and Rock River were the best both for colour and texture, and those from York Pen and Constant Spring came a good second. A firm of cigarette manufacturers kindly had some cut up and made up into cigarettes, which smoked quite well. The Rock River sample was cut up into a broader cut as pipe tobacco and mixed with 25% Latikia. This sample made quite a good pipe tobacco. Two things will have to be remembered when producing the Virginia variety. Firstly, great attention must be taken when harvesting the leaf, as unripe leaves will not cure well, and too over-ripe leaves become dry and brittle, so harvesting must take place when the leaf is just becoming over-ripe, and secondly, great care is necessary after the leaves have been placed in the flue-barn, as the desired lemon yellow colour must be produced to give the tobacco any value, and if the heat is regulated rightly it will set the colour. The fault found with the samples was that the colour changed to a reddish yellow after keeping open for a short time.

3. From the manurial tests it was found that the 5.10.10 mixture and the 8.20.24 mixture were the best. The report on the other manures are as follows:—10.20.25 fair, 5.20.10 poor, 5.10.20 fair, but hot burning. The 5.10.10 mixture was used in general, so 10 rows were taken for each other kind of manure with 10 rows of 5.10.10 between each, and in the field it was seen that the 10.20.25, 8.20.24 and 5.10.10 gave the best results so far as growth and size of leaf, but as it is really the burning qualities that count, it was decided to keep only the 5.10.10 and 8.20.24 mixture for future use. In all these mixtures only Sulphate of Potash was used, as Muriate of Potash *must* not be used in the production of tobacco, as it affects the burning qualities very much; in fact, tobacco, which has been manured with Muriate of Potash will often not burn at all.

4. The 1938 crop was started in July, when all the land was thoroughly ploughed up and the cover crop of Cow peas or Bengal bean well turned in. 164 seed beds were laid out at the 3 plots, Hope, Constant Spring and Temple Hall, and 20 beds at the plot in St. Elizabeth (Lititz). All did well and there were not so many ants this year to contend with, though some heavy rain rather spoilt a few beds. All were treated with Cheshunt mixture by means of sprays, and when necessary Lead Arsenate was mixed in with Cheshunt mixture to combat insect pests. This year very few beds were affected by *Phytophthora*, which seems to show that in Jamaica calico covering is better than grass covering for the beds, and it is certainly cheaper, unless grass is very easy to procure. This year only 4 types of tobacco have been planted, viz., Havana, Sumatra, Puerto Rican UX and S30, and Virginia (Gold Dollar). The new type of Sumatra has grown very well and some very fine tobacco has been harvested from that plot. The Puerto Rican varieties will not be planted again, as the binder percentage from these types is small, but for the small grower, who requires a large crop for sale locally, these types ought to prove useful. Seed has been collected again this year for distribution. Many growers have bought both seed and suckers produced at the experimental plots. In fact, every available sucker was sold after the plots had been planted out. The crop this year has been much better than last year, as the weather conditions have been favourable, and during the dry months we were able to irrigate two of the plots, which have produced some very good tobacco. Harvesting is not yet completed, but it is expected that the quality of tobacco will be better than last season, especially as very few ratoons will be harvested. The ratoon crop only gives small coarse filler leaf when the plants are topped high, as we have been doing this year, but by topping the "principal" high, a greater percentage of better leaves are procured. Some Virginia suckers have again been sent to Grove Place and also to a planter in St. Mary. The leaves from these plants will also be cured here to see how they turn out.

5. *Development Scheme, 1937 crop.*—There were 37 registered growers and 6 growers who signed agreements to hand over all their tobacco to the Tobacco Station. These began delivering their tobacco in March and continued up to July. Forty-nine other growers brought in tobacco, which was bought outright at prices ranging from 7d. to 9d. per lb. nett weight. Altogether 148,032 lbs. nett weight of tobacco was delivered at the Tobacco Station. Most of the 1937 registered growers managed to plant off their fields, but in many cases too late in the season, when the thought had set in, so good land was wasted. £4,129. was advanced by Government to these growers partly to build barns and other premises, and a first price according to rough grading at from 7d. to 9d. a lb. it was found that £1,125. was still owing, but after the sales are completed it is hoped that this debt will be decreased. Some of the growers have already made a profit, and to these £677 have been paid out already. The next thought seems to be with the nurseries. Very few of these growers have really successful nurseries. They will and continue with

"hush nurseries," as they find water nurseries too much work. It happens yearly that their first nurseries are burnt out by the sun during the rainless season in August or September, and their later seed-beds are flooded out when the heavy rain falls. It is more by good luck than management that any of them ever have suckers at the right time to plant out.

6. *Development Scheme, 1938 crop.*—There were 39 registered growers for the 1938 crop, and 5 growers who signed agreements. These have planted respectively 356 and 22 acres, making a total of 378 acres, for which a sum of £5,930 has been set aside for advances. More advances were given this year to certain growers to help them build tobacco barns on newly taken up land at Woodleigh. The advances for barns are to be paid back in two years. No growers were given contracts at Constant Spring this year, as these planters cannot produce high yielding crops, chiefly because they will not plant at the right season, and always have trouble producing suckers. The land at Constant Spring is becoming worn out too, as the planters do not manure the soil, and even though most of them plant cow peas after the crop, no good is done to the soil as the cow peas are allowed to bear and a crop of peas is collected before the dried up plants are ploughed in. The registered growers are planting as follows:—

Woodleigh	..	216 acres	
York Pen	..	49	"
Lucky Valley	..	35	"
Kinloss	..	15	" 315 acres in Clarendon

Colbeck .. 41 acres 41 acres in St. Catherine.

At Woodleigh the crop has come on well and most of these planters should be able to deliver enough tobacco to pay back their debts and many of them should be able to make a profit. There are, however, a few who have done very badly by wasting money on unnecessary work, and having to buy suckers instead of having their own. These few have not yet planted off their fields and have probably missed the season. If rain falls next January they might be able to produce sufficient tobacco to pay off their debts. Both at Colbeck and Lucky Valley the crop promised well, but through lack of rain it is feared that the crop will be small. No rain has fallen for the last 2½ months, in these districts. The York Pen crop like Woodleigh should be very good, as there have been several showers of rain since planting. After the registered and "agreement" growers have delivered their crops it is expected that tobacco will still have to be bought from other independent planters to make up what will be short from the Old Harbour and Rock River districts. All the registered growers have gone over to planting the Havana type, which gives a much finer, broader leaf and is more acceptable to the manufacturers. They also now know how to collect good seed, but they still persist in collecting much more seed than is necessary, and thereby lose many first class plants kept as seed trees which otherwise could have been cut down and the leaves harvested, giving them a greater percentage of good binders.

7. *Independent Growers and Exporters.*—Through the Tobacco Regulations all tobacco has to be examined at the Tobacco Station before it is shipped, and now that these growers and exporters have been taught to grade and put up their tobacco in the proper way the examination is made less difficult. Two independent growers have sent their tobacco for drying and re-packing at the Tobacco Station, and this has been shipped on their behalf. Three exporters have shipped after examination at the Station, and the only fault to find with the tobacco was that it was not dried out enough. The moisture content should not be more than 14% or less than 10%. From these independent growers and exporters 21,612 lbs. from the 1936 crop, and 34,479 lbs. from the 1937 crop have passed through the Station for shipment to the United Kingdom, and 504 lbs. from the 1937 crop were sent to Bermuda.

8. *Government Tobacco Station.*—The Station was enlarged during the year. A new Fermenting Shed of 100 ft. by 30 ft. was built, the existing thatched building was improved and a plank floor installed, also more equipment was procured so that 150 women could work in the grading and measuring shed. With 164,704 lbs. gross weight of tobacco to handle work has proceeded steadily from April to the end of the year. Through the employment of a larger number of women the grading and measuring was finished by the end of September, which gave time for the tobacco to ferment out properly. An early start had to be made packing and shipping as much as possible during the dry weather and, as last year, the tobacco was aired out just before packing to bring the moisture content down to what the buyers were clamouring for. A certain amount of flavour and aroma is lost through this airing, as the leaf should really be kept packed for a considerable time, at least 9 months, to mature and dry out naturally; however, the buyers seemed to think the loss of aroma outweighed excess of moisture. The shipments to the end of December accounted for 77,053 lbs. so there is still a considerable quantity to pack and ship in the new year. More tobacco was stripped this year, which gave work to the women when all other grading work was finished. The average number of women employed during the season was 106 per day, making the total working days 23,689. To cut down the costs fewer grades were sorted. There were 3 binder grades, and 4 filler grades. Any "heads," which were obviously only filler leaf, were not graded for quality, but only measured, and kept clean of "fonque." This saved considerable expense. Nearly all short lengths were striped, and the No. 1 binders were carefully graded for quality, so that prices for these grades would be increased.

9. As all wages were increased in June the actual cost per lb. for handling the tobacco will be in the neighbourhood of 5d. which is 1d. per lb. more than last year, but as the crop is still being worked, it is not yet possible to give a definite figure as to the working costs, and it is hoped that through the saving of the expense of grading the fillers the final cost price may turn out to be less than 5d. The average price paid to growers on delivery of their tobacco was just under 8d. per lb. This may be increased after the sales are completed, as the Tobacco Specialist was able to obtain a 1d. per lb. increase from the buyers for all grades.

10. *Visit to United Kingdom.*—After all deliveries of tobacco had been made and the fermentation and grading were well under way the Tobacco Specialist visited England and took with him various samples of Creole, Virginia and Cigar leaf tobacco. These were placed in the offices of the West India Committee, and visits were then made to various manufacturers and importers, who were invited to examine the samples and report on them. Many of them did so, and were very interested. The cigar tobaccos were of course already known on the market and all considered that a great improvement had been made since the Govern-

ment had interested itself in the production of this type. What caused most surprise were the samples of Jamaican grown Virginia bright leaf. The samples taken to England were of course the best from the experimental plots. The colours were found to be good, though considerable improvement could be made, the texture of the leaf was also found to be good, and if this type of leaf could be properly produced a market would be found. It was discovered that the samples changed colour after being kept open to the air for a few weeks, therefore the setting of the colour was not satisfactory. This will have to be improved. The Creole samples were not favourably received, and all thought this type of tobacco, as now produced, too non-descript in type and too mixed in colour to find a market in England except at a very low price. A market could be found for such types on the continent, but again the prices would be too low for any Jamaican grower. The actual prices offered were from 4d. to 7d. a lb., the higher price being for some of the smoke-cured leaf. Samples of tobacco stalks, midribs and "fonque" were examined and tested at the Imperial Institute to find out how much nicotine could be extracted, but as the nicotine content was so small it would not pay to ship such scrap, therefore it was suggested that extract could be made for local use only. As Virginia leaf production in Jamaica has already been started by two or three private individuals and as the samples were well commented upon in England, the Tobacco Specialist brought back with him samples of some of the best grades as sold in England. These samples consist of tobacco from America, Canada, Rhodesia and India and are on view for anyone to see at the Tobacco Station, and should prove helpful to all producers of this type to show them what kind of leaf they must produce to make it a marketable article, either for local or export sale.

11. *Miscellaneous*.—Correspondence as usual was considerable and many enquiries were received regarding the growing of both the Havana and Virginia types of leaf. Tobacco circulars were sent out to all who seemed interested in tobacco planting, and visits were made to many new planters to show them how to plant and produce a marketable article. Various queries regarding diseases, pests, etc., were satisfactorily answered. Visitors to the experimental plots were not so numerous as last year. However, quite a number of planters themselves came to see the nurseries. It is hoped that in time all tobacco planters will be convinced that the only sure way of producing good suckers at the proper time is the method employed at the experimental plots.

J. W. WINCKLEY,
Tobacco Specialist.
30.1.39.

(xii) *Report of the Chief Inspector of Produce.*

I have the honour to submit a report on the Produce Inspection Division of the Department of Agriculture, for the year ending December, 1938.

The activities of this Division extended in many directions, and it would be easiest perhaps to mention these under the following heads:—

1. PRODUCE LAW—REVISION OF THE CITRUS REGULATIONS.

During the year the Citrus Regulations were revised after consultation with growers and packers, and recommendations made by the Produce Board to the Governor in Privy Council were approved. These Regulations require an exporter to pack fruit, including limes, only in a fully Mechanised house with suitable appliances, all subject to the approval of the Chief Inspector of Produce.

We have been gradually working to this end over a period of years, and it is gratifying to note that the packers did not only fall into line with these Regulations, but found it to their interest to do so.

While in London during the year, I visited several importers of Jamaica citrus fruit, and I was informed that our pack, in their opinion, could not be improved. They stressed the importance of debuitoning our fruit before shipment, boraxing it to preserve it from rot, and the general adoption of the colour-added process which enhances its value.

The Regulation under the Citrus Regulations requiring a Certificate of Inspection before fruit is accepted on board is working satisfactorily. This entails considerable work on the part of the Inspectors, both day and night, and the time is now here when an increase to the staff is necessary to meet the more exacting requirements of the shippers with regard to inspection.

2. REVENUE FROM LICENSES UNDER THE PRODUCE LAW.

There has been a falling off in Revenue from Licenses during the year of about £400. A still further drop is expected in the current year, due to a reduction in the cost of a Produce License from £5 to £2 10s., and to the banana companies having largely discontinued the purchase of fruit in the country parts. The following figures show this reduction:—

<i>Revenue from Licenses:</i>			
1935-36.	1936-37.	1937-38.	Half-year 1938-39.
£7,806	£5,598	£5,135	£2,705

3. PRODUCE UNDER CLASS 1 AND 2—BANANAS AND CITRUS.

Bananas.—The large export of bananas during the year has been a surprise to many, in that a considerable reduction was expected over last year's maximum export of 27 million. This, I think, is to be attributed largely to the great increase in planting during 1936-37. The Produce Inspectors have done all possible to maintain the quality of fruit exported. The Companies themselves have also insisted on the rejection of poor fruit. A high standard has been maintained by the Inspectors in the rejection of all fruit which is bruised, damaged or immature. This action has undoubtedly been of the greatest assistance to the Companies and growers in the maintenance of reasonable standard for export.

Citrus.—The volume of our citrus export has improved during the year from that of last year. We have exported for the crop up to the present time, December 31st, all of which have been examined and passed by the Produce Inspectors, a total of 296,132 cases, which is made up as follows:—

Oranges.	Grapefruit.	Sour Oranges.	Tangerines.	Limes.
176,789	65,678	52,738	12	915

It is to be regretted that the demand for grapefruit has been very limited without any sign of improvement. Growers are very disappointed and distressed that they are unable to sell their grapefruit. The cost of placing a box of grapefruit in the English market at the present time is below that of the packing and transportation charges, and even were grapefruit given to the packing houses free of cost, it would still be unprofitable to ship. On the other hand, our New Zealand shipments have been very satisfactory; the price has been somewhat disappointing for our early shipments, but this has improved, as has also our quota for that market. Reports shew that the arrival of our shipments have been satisfactory to the New Zealand Government. We, as Inspectors, have maintained an unusually high standard of quality to this market and the satisfaction this has given has undoubtedly contributed to the additional orders placed during the present crop.

Pimento, Coffee, Ginger, Annatto, Honey and other small Produce.—These have received the special attention of the inspectors during the year. Our efforts have been directed towards the better curing, better grading and a better packed product. Produce Depots and the books kept by dealers in such depots, have been continually examined by Inspectors and these have been kept in a satisfactory manner. This inspection work is of great value in that it keeps to a high standard, the quality of produce purchased and sold.

It is interesting to note, while in England I visited two of the principal honey brokers who handle Jamaica honey. They both informed me that for six years there has been no complaint with regard to Jamaica honey by buyers; that our quality and pack is entirely satisfactory and that the price obtained for our honey, in comparison with other honeys of similar quality, is reasonable; they could suggest no improvement in this direction.

4. COURT CASES AND THE DESTRUCTION OF PRODUCE.

There were 57 cases tried during the year under the Produce Law in the Courts of the Island, the Produce Inspectors prosecuting. This is in excess of last year in which year we had 32 cases. The cases were principally brought against parties who bruised bananas in transit or bought produce without licenses.

The rejections of produce by Inspectors either for re-conditioning purposes or the total destruction of such under the supervision of the Police, in many cases exceeds that of last year. This is due to the general tightening up of inspection by our Department which we found to be necessary in the interests of our export. For instance, Inspectors rejected last year 44,000 stems of bananas as compared with 63,000 this year. Of citrus we destroyed 654 boxes last year as compared with 1,252 this year. The fruit destroyed were either so immature as to be quite unfit for consumption or so bruised and damaged in reaping as to make it both unfit for export or for local use. The following table gives details of this, shewing the quantity of produce destroyed, the quantity re-conditioned and that allowed for local use:—

	Rejected.	Reconditioned.	Destroyed.	Detained.
Bananas ..	62,706			
Citrus ..	..	1,290 boxes	1,252 boxes	31 boxes
Limes ..	..	4 brls.	..	..
Annatto ..	..	2 bags	2 bags	..
Pimento ..	..	137½ "	37 "	..
Coffee ..	..	6 "	..	4 bags
Honey ..	..	332 casks	..	..
Ginger ..	..	8½ bags	..	..
Orange Oil ..	..	..	9 bts. (adulterated)	..
Cocoa ..	..	1 bag	..	..

5. *Produce Board.*—The Produce Board, under the chairmanship of Sir Alfred D'Costa, Kt., had 7 meetings during the year, when matters pertaining to the control of our agricultural exports were discussed and directed, in so far as such control came within the scope of the Produce Board.

The export of Citrus fruit to New Zealand was quoted by the Board among the shippers on a basis of a total export of 60,000 cases, allocations only being made to shippers who could show that they had made suitable arrangements for the mechanical packing of such fruit.

On my return from England in October, I submitted a Report to the Acting Director of Agriculture on the marketing of Jamaica bananas in England. This report was considered by the Government and referred to the Produce Board. The Board, through its chairman, invited Managers of the Companies with their staffs, for the general consideration of this report which shewed that Jamaica bananas as shipped were unsatisfactory to the English buyers, in that there was too large a percentage of short-fingered fruit being shipped, thus making it unprofitable for dealers to handle our fruit. The report also shewed that our bananas arrived in England with considerable stem rot and that the stowing of such fruit at this end was most unsatisfactory in that the cargoes on arrival were found to be bruised far in excess of what should reasonably be expected under normal conditions. The report suggested action in certain directions for the improvement of our banana industry. It was agreed at this meeting that action should be postponed on the matter until May of this year.

The personnel of the Board has remained the same during the year, the following gentlemen being members thereof:—

Sir Alfred D'Costa, Kt., Chairman.
 Hon. A. C. Barnes, C.M.G.
 V. L. George, Esq.
 Hon. R. Ehrenstein.
 F. E. V. Smith, Esq.
 G. G. R. Sharp, Esq.
 A. F. Thelwell, Esq.
 J. G. Kieffer, Esq.

6. *Staff*.—The staff of this Division was unchanged during the year, and consists of the following:—

P. W. Murray		Chief Inspector of Produce.
A. M. Douet, Esq.		Inspector of Produce.
R. C. Somerville, Esq.	..	do. do.
H. B. Monteith, Esq.	..	do. do.
I. H. Campbell, Esq.	...	do. do.
C. M. G. Purchas, Esq.	...	do. do.
T. V. Thomson, Esq.	..	do. do.
Miss U. Foster Davis		
Miss C. D. Levy		
Ruby Waugh		Messenger

Leave was granted to the following members of the Staff during the year:—

	Sick.	Deptl.	Vacation.
P. W. Murray	..	4 days	3 months
A. M. Douet	...	14 "	1 month
R. C. Somerville	...	9 "	2 months
H. B. Monteith	.. 2 days,	9 "	10 days
I. H. Campbell	..	8 "	...
C. M. G. Purchas	...	14 "	...
T. V. Thomson	3 days	12 "	...
U. Foster Davis	5 "	14 "	...
C. D. Levy	..	4 "	4 months

P. W. MURRAY,
 Chief Inspector of Produce.

C.—RESEARCH AND LABORATORIES.

(xiii) Report of the Deputy Island Chemist.

The total number of samples analysed during the year ended 31st December, 1938, was 5,148, and compares with former years as under:—

1934	1935	1936	1937	1938
3,639	3,895	4,698	4,941	5,148

The samples are classified as follows:—

"A." OFFICIAL SAMPLES.

(1) Police, Criminal and Toxicological—

Human Viscera and Organs for Poison	..	201
Stomach Washings (5) and Vomits (14)	..	19
Urines	..	4
Animal Viscera for Poison	..	4
Substances and Articles examined for Poison	..	190
Exhibits in Murder Cases and cases of shooting with intent:		
Shot Guns 1, Revolvers 9	..	10
Cartridges 15, Cartridge Cases 3	..	18
Bullets	..	9
Articles of Clothing	..	15
Specimens of Railway and Motor Car Grease	..	4
Exhibits in cases of:		
Obeah, liquids, powders, etc.	..	29
Housebreaking and Larceny: Soils 2, coals 2	..	4
Arson: Gasolene, burnt residues	..	2
Robbery with Violence	..	2
Receiving money by Pretences: Wines 12, Rums 1,		
Herbs 45	..	58
Destruction of Property: Articles of Clothing	..	12
River Pollution: Waters	..	5
Maiming with Acids: Clothing	..	2
Sending Threatening Letters, writings 2, pencils 1		3
Miscellaneous Exhibits:		
Mineral ₂ (iron ₂ pyrites)	..	1

Exhibits submitted under various Laws:—

<i>The Food and Drugs Law.</i>	
Native Wines, genuine	3
Native Wines, adulterated	4
	7
<i>The Sale of Drugs and Poisons Law.</i>	
Drug 1, Mouth Washes 1	2
<i>The Medical Laws.</i>	
Medicines, Herbs, Drugs, etc.	325
<i>The Dangerous Drugs Law.</i>	
Opiums	11
Opium Exhibits, pipes, etc.	35
Ganga	752
Ganga Exhibits, pipes, rags, etc.	121
	919
<i>The Coining Laws.</i>	
Coins, genuine	336
Coins, counterfeit	412
Currency Notes, Genuine	1
Counterfeiting Exhibits, Moulds, Metals, etc.	203
	952
<i>The Spirit License and Rum Duty Laws.</i>	
Rums 237, Whisky 20, Gin 14	271
Bay Rums 12, Brandy 4, Planter's Punches 2	18
Wines 4, Liqueurs 2, Beers 3	9
Vermouths 2, Syrups 3	5
	303
<i>The Petroleum Laws.</i>	
Kerosene Oils	1
Total	3,101

(II) *Customs and Excise Department—*

Rum Punches 33, Liqueurs 27	60
Native Wines 33, Native Gins 2	35
Flavouring Extracts and Essences	14
Medicinal Wines 3, Drugs, Pills, etc., 7	10
Insecticides 15, Disinfectants 1, Wood Preservatives 2	18
Fuel Oils 62, Lubricating Oils 3	65
Denatured Alcohols 5, Bay Rums 1	6
Fabrics, Silks, Artificial Silks, Cottons, etc.	30
Turpentines 2, Kerosene Oils 1, Brake Fluids 1	4
Condensed Milks	4
Miscellaneous:	
Sugar Products 3, Cigarette Lighter and Fly Killing	
Liquids 4, Wrapping Papers and Bags 2, Waxes	
1, Citrus Colourings 2, Fruit Juices 1, Edible	
Fats 1, Isopropyl, Alcohols 1, Fertilizers 2	17
Total	263

(III) *Department of Science and Agriculture—*

Animal Viscera for Poison	3
Substances for Poison	1
Insecticides 2, Disinfectants 1	3
Brines 2, Waters 1	3
Food Products "Lime Ricky"	1
Instruments for test and adjustment	1
Fresh Milks 9, Waters (complete analysis) 1	10
Total	22

(IV) <i>Island Medical Department—</i>				
Fresh Milks, Genuine	..	..	..	6
Do. Adulterated	..	..	..	3
Waters, Potable	..	..	..	2
Mackerel Pickle	..	..	..	1
Medicines 1, Medicated Cigarettes 1	..	..	..	2
Soaps 2, Disinfectants 1	..	..	..	3
				17
(V) <i>Department of Public Works—</i>				
Native Corns	..	..	..	87
Waters, Potable 2, Irrigation 2	..	..	..	4
Lighthouse Oils	..	..	..	1
Total				92
(VI) <i>Jamaica Government Railway—</i>				
Waters	..	..	..	1
(VII) <i>Postmaster for Jamaica—</i>				
Documents (envelopes, etc.)	..	..	..	4
(VIII) <i>Jamaica Agricultural Society—</i>				
Cassava tubers (trial plots)	..	..	..	200
(IX) <i>Kingston and St. Andrew Corporation—</i>				
Gas Coals 1, Spent Oxides 1	..	..	..	2
Total Official Samples				3,702

"B." GENERAL SAMPLES.

Fresh Milks, Government Stock Farm	..	..	1,152
Do. Private Producers	..	..	7
Sugars	..	..	29
Rums	..	..	55
Cattle Dipping Fluids	..	..	66
Waters, Potable 19, Boiler Feed 1, Irrigation 24	..	..	44
Food Products and Feeding Stuffs:			
Coconut Meals 5, Cotton Seed Meals 1, Condensed Milks			
1, Potatoes 1, Flours 5, Porter 1, Caramel 1	..	..	15
Essential Oils, Pimento 3, Lime 7	..	..	10
Ores, Minerals and Deposits	..	..	11
Encrustations from Metals 12, Boiler Scales 3, Puncheon			
Scales 1	..	..	16
Alcoholic Liquids: Alcohols 1, Cocktails 1, Planters Punch			
1, Bay Rum 1	..	..	4
Gasolenes 2, Lubricating Oils 1, Crude Glycerines 2	..	..	5
Building sands and muds	..	..	2
Lubricants	..	..	1
Drugs	..	..	1
Coins	..	..	2
Animal Viscera for Poison	..	..	4
Horse swabs and salivas for "Dope"	..	..	22
Total General Samples			1,446
Grand Total			5,148

OFFICIAL SAMPLES.

The 201 analyses of human viscera and organs, and 19 stomach washings and vomits were made in connection with 109 deaths. In 34 cases positive results were obtained in the viscera, etc., as follows:—

Human Viscera and Organs (201).

- (1) Traces of Saponins from the organs of a female child.
- (2) Traces of Saponins from the organs of a male child.
- (3) Large traces of Oxalic Acid from the viscera of a male adult.
- (4) Traces Glucosides in the organs of a male child.
- (5) Traces Glucosides in the viscera of a female adult.
- (6) Traces Glucosides in the viscera of a male child.

- (7) Ptomaines, traces of from the organs of a female child.
 - (8) Ptomaines, traces of from the viscera of a male child.
 - (9) Ptomaines, traces of from the viscera of a female child.
 - (10) Ptomaines, traces of from the organs of a female infant.
 - (11) Traces of Saponins from the viscera of a female child.
 - (12) Ptomaines, traces of from the organs of a female adult.
 - (13) Ptomaines, traces of from the organs of a female adult.
 - (14) Ptomaines, traces of from the viscera of a female adult.
 - (15) Ptomaines, traces of from the viscera of a female adult.
 - (16) Ptomaines, traces of from the viscera of a male child.
 - (17) Ptomaines, traces of from the viscera of a female child.
 - (18) Ptomaines, traces of from the organs of a female adult.
 - (19) Ptomaines, traces of from the organs of a female child.
 - (20) Ptomaines, traces of from the organs of a male adult.
 - (21) Ptomaines, traces of from the organs of a female adult.
 - (22) Ptomaines, traces of from the viscera of a female child.
 - (23) Oxalic Acid, large traces of from the organs of a male child.
 - (24) Alcohol, 17 minims from organs of a female infant who drank Proof Rum by mistake.
 - (25) Arsenic, 0.022 grains, and Cresols from the organs of a male adult.
 - (26) Alcohol, 1 fluid drachm from stomach contents of a male adult.
 - (27) Cresols, $\frac{1}{2}$ fluid ounce from organs of a male adult suicide.
 - (28) Arsenic, 0.009 grains and traces of Bismuth from the organs of a male adult.
 - (29) Arsenic, 0.024 grains from the viscera of a female adult.
 - (30) Kerosene Oil, large traces from the stomach of a female infant.
 - (31) Nicotine, 15 grains from the organs of a male adult suicide.
 - (32) Hydrocyanic acid, large traces from the viscera of a female infant.
 - (33) Cresols, $1\frac{1}{2}$ fluid ounces from the viscera of a male adult suicide.
 - (34) Arsenic, equivalent to 0.03 grains Arsenite of Soda from the viscera of a male infant.
- Negative results were obtained in 67 cases.

STOMACH WASHINGS (5).

Negative results were obtained in the five specimens examined.

Vomits (14).

- (1) Arsenic, equivalent to 0.28 grains Arsenite of Soda in 5 ounces vomited matter.
- (2) Barium Sulphate, 10 grains.
- (3) Traces Carbolic acid (attempt at suicide).
- (4) Large traces Chromium.
- (5) Cresols.

Negative results were obtained in nine cases.

Urines (4).

- (1) Large traces Cresols in a case of suicide.
- Negative results were obtained in three cases.

Animal Viscera (4).

In none of the four cases analysed was poison detected.

Substances examined for Poison (190)

190 substances and articles in connection with 84 different cases gave positive results in 80 cases as follows:—

- (1-5) Paris Green in a tin, cup, spoon, tin opener, and on a Blazer in a case of a female suicide.
- (6) Arsenic, equivalent to 12 grains Arsenite of Soda per gallon in water suspected to have been poisoned.
- (7) Arsenite of Soda in a tin.
- (8) Cresols (Lysol) in a bottle
- (9) Cresols (Lysol) on a dress.
- (10) Copper Sulphate, 1,300 grains per gallon in poisoned water.
- (11) Cocaine on a horse bit.
- (12) Strong Carbolic Acid on a garment.
- (13-14) Magenta dye in cooked foods.
- (15-16) "Dumb Cane" juice in two waters.
- (17-18) Powdered Quassia in two powders.
- (19) Arsenic in poisoned sweet potatoes.
- (20) Strong Nitric Acid in a Phial.
- (21) Cochineal in a liquid used in an attempt to improve the appearance of fresh fish.
- (22) "Soap Bank" and "Cow Itch", in a powder.
- (23) Paris Green, 1.9 grains per pint in a water.
- (24) Arsenite of Soda, in fine salt.
- (25) Arsenite of Soda, in coarse salt.
- (26) Arsenite of Soda in Bammies (Cassava).
- (27) Red Mercuric Oxide in a powder.
- (28) Red Mercuric Oxide in a cup used in an attempt at suicide.
- (29) Lysol in a drinking glass used by a suicide.
- (30) Copper Sulphate in a bottle of liquid.
- (31) Aluminum Paint in a phial used in an attempt at suicide.

- (32-33) Moringa Perygosperma beans in two waters.
- (34) Barium Sulphate in a powder.
- (35) Barium Sulphate, large traces in sugar.
- (36) Powdered glass in cooked food.
- (37) Powdered glass in Bread.
- (38) Lysol in bottle of liquid used in attempt at suicide.
- (39) Carbolic Acid in a liquid used in attempt at suicide.
- (40-41) Arsenite of Soda in two waters in an attempt at Cattle poisoning.
- (42) Lysol in a liquid—attempt at suicide.
- (43) Nicotine Sulphate in a phial used by a suicide.
- (44) Nicotine on a bath towel.
- (45) Mineralised Methylated Spirits in a suspected liquid.
- (46) Hydrocyanic Acid—large traces in cassava in a mug.
- (47-48) Lysol—large traces in two prepared cocoas.
- (49) Lysol in a liquid used in an attempt at suicide.
- (50-51) Powdered glass in sugar and in a mug.
- (52-55) Powdered glass in four specimens of grated coconut.
- (56) Powdered glass in bread.
- (57) Lysol in a liquid used in an attempt at suicide.
- (58-61) Yellow Phosphorus in tubes used to poison a public water supply.
- (63-63) Arsenic in boxes of Rat poison used to poison a public water supply.
- (64) Powdered glass in Cassava flour.
- (65) Lysol in a bottle of liquid used by a suicide.
- (66-67) Arsenite of Soda in two poisoned sugars.
- (68) Santonin in a suspected powder.
- (69) Arsenite of Soda in a suspected powder.
- (70) Copper Sulphate in a powder.
- (71-72) Copper Carbonate in two suspected powders.
- (73) Arsenic and blue colouring matter in a suspected powder.
- (74) Arsenite of Soda in a powder suspected to have been used to effect a poisoning.
- (75) Arsenic and Cresols (Cooper's Dip) in a phial.
- (76) Strong Sulphuric Acid in a phial.
- (77) Jeyes Fluid in a suspected bottle of liquid.
- (78-79) Cresols in a specimen of soup and on a cork.
- (80) Mercuric Chloride in a suspected liquid.

(I) *Police and Judicial Exhibits, Criminal and Toxicological.*

The number of Exhibits for the Police and Judicial Departments, 3,101, remains about the same as last year (3,113), while the number of Certificates issued in connection with the examinations and analyses, 559, shows an increase of 58.

Analyses of human viscera and organs in cases of suspected poisoning showed an increase of 80 over last year, being 201 as against 121.

Substances and articles examined for poison also showed an increase, being 190 as against 98 for the previous year, an increase of 92.

Exhibits in cases of murder and attempted murder remained about the same as last year being 56 as against 62.

"Obeah" exhibits showed an increase over last year being 29 as against 16.

Exhibits submitted under the Coining Law totalled 952, as against 691 for the previous year, an increase of 261. Included in the 952 exhibits were 412 counterfeit coins, and 203 counterfeiting exhibits comprising moulds, various metals, alloys, chemicals, silvering solutions, etc., representing an increase of 141 and 16 over last year. The standard of manufacture of counterfeit coins on the whole continues to improve, and the Police are to be congratulated on the determined efforts displayed in putting down this class of crime. As a result of Police activities during the latter half of the year, the Deputy Island Chemist was called upon to give evidence in the last session of the Kingston Circuit Court alone in no less than 17 cases of making and uttering counterfeit coins, convictions being secured in all but two cases, and one notorious counterfeiter being given a sentence of 10 years Penal Servitude.

The number of Exhibits submitted under the Dangerous Drugs Law show a decrease of 995 from last year. Opium and Opium Exhibits being 268 less, and Ganga and Ganga Exhibits 727.

A total of 303 exhibits were submitted under the Spirit License and Rum Duty Laws and represent an increase of 221 over last year.

325 various Medicines, Chemicals, Drugs, etc., were analysed in connection with prosecutions under the Medical Law, an increase of 311 over the previous year.

(II) *Customs and Excise Department.*

Analyses done for this Department showed a decrease this year being 263 as against 514 for the previous year.

30 fabrics for determination of their composition were analysed as against 121 for last year.

95 samples of alcoholic liquors were examined for duty purposes and drawback.

14 Essences were tested for alcoholic strength and purity being less 6 than last year.

65 mineral oils were analysed as against 66 for the previous year.

The other articles submitted by the Customs Department were mainly for classification purposes under the Tariff Laws.

(III) *Department of Science and Agriculture.*

3 specimens of animal viscera were analysed for poison with positive results in 1 case which showed arsenical poisoning of a horse.

A substance analysed for harmful constituents was found to contain arsenic.

2 brines and 1 water for the refrigerating plant at the Low Temperature Station were analysed and recommendations were made regarding their suitability.

1 beverage, "Lime Ricky," was completely investigated with a view to making use of lime oil.

9 milks and 1 water were examined in connection with the proposed establishment of a Condensed Milk Factory.

(IV) *Island Medical Department.*

Of 9 samples of milk submitted 3 were found to be adulterated. The other 8 samples were of a miscellaneous nature.

(V) *Department of Public Works.*

Of 92 samples submitted 87 consisted of Native Corn in connection with contracts made by suppliers. The quality of local corn maintained its good standard.

4 waters were submitted and a sample of lighthouse oil was analysed for specification confirmation.

(VI) *Jamaica Government Railway.*

A sample of water for use in batteries was analysed and advice regarding its suitability was given.

(VII) *Post Master for Jamaica.*

4 envelopes were examined with a view to ascertaining whether they had been tampered with.

(VIII) *Jamaica Agricultural Society.*

Analysis of 200 specimens of Cassava tubers was carried out in connection with an Island wide investigation of growing various varieties. The results were communicated to the Secretary of the Society who is compiling a report from the data. This should prove useful in view of the demand for Cassava starch.

(IX) *Kingston & St. Andrew Corporation.*

2 samples of coal and spent oxide from the Gas Works were submitted.

B. GENERAL SAMPLE.

1,152 samples of fresh milk from the Government Stock Farm were analysed and compared with 945 for last year. The results showed that the high quality of milk from this source is maintained.

66 specimens of Cattle Dip were submitted and recommendations were made for bringing the contents of the respective dipping tanks to full strength.

55 samples of Rum - chiefly for complete analysis, were submitted. These show a considerable decrease as compared with last year when 109 samples of rum were received.

29 Sugars were tested as against 32 for the previous year.

22 specimens of horse's saliva were examined for Drugs on behalf of the Jamaica Jockey Club.

44 samples of waters were analysed for private individuals comprising 19 potable, 1 boiler feed and 24 irrigation waters.

10 Essential oils of local manufacture were submitted by various manufacturers.

11 Minerals and ores were examined for identity and assay of metal content.

12 cases of damaged metal goods were investigated on behalf of Insurance Companies.

A dog was found to have been poisoned by Phosphorous.

The other articles under this head were of a varied nature as shown by the tabular statement.

The manufacture of Paranaph and the preparation of Fly Killer, Book Poison and Thymol powders was continued throughout the year. The demand for Fly Killer and Book Poison shows an increase over former years.

The supply of chemicals for use in fumigating infested plants and saddles at the various Fumigatoriums as well as the destruction of stray dogs by the Police in Kingston, was carried out as formerly.

2,460 letters, orders, etc. were received and dealt with during the year. This number is not inclusive of personal and cash orders dealt with.

The following table shows the nature and amounts of materials supplied to the public for the past five years, also the amounts collected in fees and for sales during the same period.

Items.	1934.	1935.	1936.	1937.	1938.	Weight.	Remarks.
Paranaph ..	33,373	36,654	35,942	38,976	33,859	lbs.	Sale discontinued
Arsenite of Soda	20,300	21,200	19,736	21,650	19,450	lbs.	
Copper Sulphate	4	..	..	..	..	lbs.	
Carbon Bi-sulphide ..	1,164	1,338	866	1,092	997	lbs.	
Rat Poison, bulk	130	183	183	201	104	lbs.	
Rat Poison, 1 oz. packets ..	550	301	70	72	212	pkts.	
Thymol Powders	248	167	230	247	222	ozs.	
Standard Iodine Solution ..	34,500	36,000	29,750	36,000	27,250	c.c's.	
Starch Solution	196	187	161	176	157	Bottles	
Soda Bicarbonate	31	42	31	37	32	Bottles	
Testing Cylinders	9	15	13	22	16	No.	
Testing Bottles ..	8	18	10	16	19	No.	
Cyanogas ..	25	273	187	81	93	lbs.	
Fly Killer ..	332	349	430	538	591	Gallons	
Book Poison ..	8	11½	13	13	35½	Gallons	
Laboratory Fees	£240 1 0	£143 9 0	£184 5 6	£180 2 1	£157 1 3		
Laboratory Sales	939 19 0	996 6 1	995 0 0	1,209 13 1	1,018 3 3		

STAFF.

The Staff of the Government Laboratory (Division of the Deputy Island Chemist) on the 31st December, 1938, consisted of:—

Deputy Island Chemist	..	1
Assistant to the Deputy Island Chemist	..	1
Senior Technical Assistant	..	1
Junior Technical Assistants	..	2
Clerk and Storekeeper	..	1
Typist and Stenographer	..	1
Storeman and Boiler Attendant	..	1
Messengers, Male 1, Female 1	..	2

10

Mr. W. L. Barnett, Deputy Island Chemist, officiated as Acting Director of Agriculture and Island Chemist from 10th June, 1938, to 10th December, 1938, during which time Mr. E. N. Richards performed the duties of Acting Deputy Island Chemist.

Mr. L. A. Boothe, Clerk and Storekeeper, was appointed a Second Class Clerk in the office of the Director of Agriculture with effect from 13th June, 1938, and Mr. D. C. Davis, Technical Assistant, was appointed in his place as from that date.

Miss J. Blake was appointed as Typist and Stenographer and assumed duty on 2nd August, 1938.

W. L. BARNETT,
Deputy Island Chemist.

(xiv) Annual Report of the Entomologist for the year 1938.

Much progress has been made in applied entomology; planters and the public in general have shown increased interest in the control of insects and the outbreaks recorded hereunder have generally been brought under control by their energetic and timely co-operation.

The pests found attacking plants are recorded below under separate headings and according to crops affected.

INSECT PESTS.

Sugar Cane.—An outbreak of the Brown Weevil, *Melamasius sericeus* (Oliv.), occurred in St. Catherine. Formerly this insect had only been found attacking the spent stems of bananas, dead coconut trees, and canes which have been damaged by wind or by rats. The above mentioned outbreak was detected when the crop was being reaped from fields where the canes were over-ripe, the crop on that property having been delayed by two months. The variety most seriously infested was B.H.10 12, and to a similar degree, S.C. 12/4 and Ba.11569, while on P.O.J. canes of the same age and growing in adjacent fields, infestation was insignificant.

By boring into the rhizomes through the cut ends of the stalks, the pest would have thus severely damaged the ratoons.

The sanitary measures we advised consisted in—

- (1) destroying as many of the insects as possible by burning all the trash left in the field,
- (2) cutting all the stumps at ground level and cleaning the fields of all pieces of stalks in which the pest would have continued to thrive,
- (3) covering with soil the lesions where the stalks have been cut from the rhizomes.

The pest was thus rapidly brought under control at very small cost and the subsequent crop has not suffered.

An article has been published in the Journal of the Jamaica Association of Sugar Technologists giving all necessary information about the biology of the pest and how it should be controlled.

The figures obtained from the Annual Survey of the Sugar Cane Moth Borer (*Diatraea saccharalis*) in the experimental fields at Hope are compared hereunder with the data obtained during the two previous years.

% Nodal Infestation.

	1936.	1937.	1938.
F.C.916 ..	0.62	10.89	2.28
B.2935 (New) ..	*	*	1.11
B.3013 (New) ..	*	*	2.37
Ba.11569 ..	0.	3.4	0.86
White Transparent ..	*	0.	0.44
B.726 ..	0.	0.49	0.
P.O.J.2878 ..	0.	2.48	0.
P.O.J.2727 ..	0.	*	1.66
P.O.J.2714 ..	0.	0.	0.
B.3439 (New) ..	*	*	0.
M. 28 ..	0.	2.00	0.
B.417 ..	0.	0.	0.
E. K.28 ..	1.60	*	0.
P.O.J. 2725 ..	3.00	*	0.
Co.213 ..	6.5	0.	*
Co.281 ..	9.1	0.	*
S.C. 12/4 ..	0.	3.77	*
Mexican stripe ..	1.68	1.86	*

* No canes available for comparison.

Destructive outbreaks of *Lachnosterna jamaicensis*, Arrow, occurred in Trelawny during the early part of the year. So as to ascertain the relative economic importance of the species of Scarabeidae (locally known as macaca worms) which attack sugar cane, a survey covering the whole island was undertaken.

In Trelawny, where the agricultural practice known as 'fly penning' is carried out (this consists in keeping cattle penned on fallowed fields which are to be replanted), *Lachnosterna jamaicensis*, Arrow, has been found causing considerable damage. The adults lay their eggs in fly penned fields enriched with manure. As these fields are not ploughed before planting, the larvae which have been hatched out in great numbers attack the growing plant canes, sometimes with disastrous results, the effect of the destruction of roots becoming more pronounced during periods of drought. As infestation always remains localized in the manured fields, forking and hand-picking the grubs where heavy infestation occurs, is easily carried out.

The survey showed that next in importance was *Strategus titanus* F., the adults of which are locally known as Rhinoceros beetles, because they sometimes bore through the stems of coconut trees. In sugar cane fields, they lay their eggs in the husk of coconut which in the drier districts are used as mulch. A short time after hatching, the larvae leave the husks which have decayed or dried up, to burrow in the soil where they cut the roots and often gnaw deeply into the rhizomes of growing canes. They are thus responsible for the death of many stools. Where the pest is common, coconut husks should not be used for mulching sugar cane.

Ligyris tumulosus Burm. which is very common all over the Island and which has proved a destructive pest, since vegetable growing has been undertaken on an extensive scale in the island, has also been occasionally found in cane fields, but never in large numbers or causing appreciable damage.

Banana.—On the larger estates the Banana Borer has been satisfactorily kept under control by agricultural practice. To combat this pest where control by human intervention is difficult, three shipments of insect predators have been introduced.

Plaesius javanus Er.—On the 26th February the second shipment of this predatory beetle was received from the Department of Agriculture of Fiji. Of this consignment, 192 beetles or 79% of those despatched from Fiji arrived alive. With a view to establishing a second centre of distribution to supply the western districts, one hundred of these insects were liberated in a heavily infested banana field in the parish of St. James. The other individuals were placed in a plot in St. Andrew where the 702 beetles from a previous shipment had been liberated. It is gratifying to note that eggs and larvae of this predator were subsequently found in the field.

All the insects from a third consignment which left Fiji on 24th August failed to survive the journey.

Dactylosternum hydrophiloides McL. and *D. abdominale* L.—A second shipment of these insects from the Federated Malay States arrived on the 8th February. These were liberated in two fields in St. Mary where infestation by the banana borer and other conditions had been considered propitious to their establishment and rapid multiplication.

Of a third consignment of 2,000 beetles shipped via Trinidad, only 5% arrived alive on the 11th November.

Larvae from the first shipments of each species have been recovered in the field, but only in very small numbers.

The scale insects *Chrysomphalus aonidum* L., and to a lesser extent, *Selenaspidus articulatus* Morg. and *Vinsonia stellifera* Westw. have been found in increasing numbers in banana fields which had been sprayed with Bordeaux mixture to control the Leaf Spot Disease. In no case, however, were the insects found to have a noticeable effect on the crop.

Citrus.—*Prepodes vittatus* (L.) and *Prepodes similis* var. *amabilis*, Waterh. locally known as Fiddler Beetles, have again proved a serious pest and one which is difficult to control.

At Grove Place systematic collection of the adults and of their egg batches has been continued as an experiment; the results are encouraging, figures showing the number of beetles and of egg batches collected are submitted hereunder:—

Month.	Beetles.	Egg Batches.
April	1,984	827
May	10,440	5,933
June	9,580	10,271
July	14,074	3,025
August	7,181	475
September	6,940	300
October	3,935	2,612
November	1,110	2,340
December	1,073	2,302

Localized outbreaks of this pest occurred in St. Thomas, in Trelawny and in St. Mary. Those concerned were advised to have the soil removed from beneath the vulnerable parts of the main roots of the citrus trees and to have the adults collected and destroyed. While capturing the adults, the egg batches were also to be collected and the egg parasite (*Tetrastichus haitiensis*, Gahan.) was to be allowed to hatch in captivity and subsequently released in the groves. Control as applied at Grove Place has given satisfactory results when carried out with the necessary thoroughness, and damages such as had been sustained in previous years has not recurred.

Minor Crops.—The insect pests which have come to attention have been:—

<i>Epitrix parvula</i> , (F.)	Infesting Garden Egg and Tomato
<i>Anasa scorbitea</i> , (F.)	" "
<i>Protoparce sexta jamaicensis</i> , Br.	" Tomato
<i>Aphis maidis</i> , (Fitch)	" Sweet Corn
<i>Silvanus surinamensis</i> , F.	" " "
<i>Disonychia laevigata</i> , Jac.	" Spinach
<i>Pontia monuste</i> , (L.)	" Cabbage
<i>Plutella cruciferarum</i> , Zell.	" Cauliflower
<i>Corythuca gossypii</i> , (F.)	" Eggplant
Aphids	" Cabbage.

The insects found attacking ornamentals have been:—

<i>Coccus viridis</i> , (G)	Infesting Aralia
<i>Pseudosphinx tetrio</i> , (L.)	" Alamanda
<i>Oiketicus abbotii</i> , Grote	" Acalypha
<i>Coccus mangiferae</i> , (Green)	" Argyle speciosa
<i>Selenaspidus articulatus</i> , (Morg.)	" " "
<i>Saissetia oleae</i> , (Bern)	" " "
<i>Saissetia hemisphaerica</i> (Targ.)	" Oleander
<i>Saissetia nigrum</i> (Nietn.)	" Poinsettia
Mealy Bugs	" Roses and Orchids.

Merchants asked for advice with regard to:—

<i>Prophilis casei</i> , (L.)	attacking Cheese
<i>Attagenus</i> sp.	" Goat skin
<i>Calandra oryzae</i> , L.	" Rice (Paddy) Corn.
<i>Sitona cerealella</i> (Oliv.)	" Rice (Paddy)

Necrobia rufipes, F. was found infesting a store-room in Kingston.

Tobacco.—Apart from occasional and slight damages caused by pests, such as ants in seed beds, cut-worms, flea beetles, etc., all of which are now controlled by routine practices well known to planters, the only pest which has called for attention has been the Horn worm, *Protoparce sexta jamaicensis*, (Br.).

Coconut.—This crop has suffered no damage from insect pests.

Mango.—The more important pests have been the Fruit Fly *Anastrepha longimacula* (Green), and the Thrip *Selenothrips rubrocinctus*, Giard.

Several unsuccessful searches made to recover the parasitic insect, *Dasyscaphus parvipennis*, (Gahan), indicate that this insect, which was introduced to control the *Scubrocinctus*, may not play the economic role which had been anticipated.

Introduction of Beneficial Insects. Three consignments of natural enemies of the Weevil Borer of bananas, *Cosmopolites sordidus*, Germar, were received (see Banana).

With the work which has been undertaken by this Division in connection with the importation and establishment of parasites and predators to combat various insect pests, the need of an insectary where such insects could be reared is being increasingly felt.

TERMITES.

Apart from insects of agricultural interest, the problem created by termites has received sustained attention. A special memorandum on the organization of Termite Control and the desirability of the co-operation of the Public Works Department to prevent infestation of buildings owned by Government has been submitted. By means of lectures, demonstrations and articles published in the Journal of the Jamaica Agricultural Society, information on lumber preservation has been made available to the public, and an illustrated booklet on the subject is now in the press. The more frequent causes which lead to infestations of buildings by termites are explained, and all necessary advice is given with regard to measures which might be applied to prevent, as well as to combat existing infestation.

Termites with reference to the Slum Clearance and rebuilding Scheme.

The writer believes that the relative importance of the causes which contribute to create slum conditions in the tropics have not been sufficiently studied. In Kingston, as elsewhere, the dilapidated conditions of houses situated in the poorer districts are primarily due to the activities of termites, slum areas being infested to an extraordinary degree. It would be unreasonable to expect that penurious people who for many reasons find it difficult to subsist on what they can earn would take an interest in termite control or be able to keep their houses in proper repair when conditions are such that even when repairs are made, the low grade lumber that is used in such circumstances becomes destroyed in a very short time.

For several reasons which would be too lengthy to enumerate here, the economic importance of termites is infinitely greater for the inhabitants of the poorer districts than for those who have well built houses in the residential areas. It has to be realised that in the older parts of the urban areas soil-inhabiting termites are extremely abundant, and the more humble the type of construction and the closer the houses are situated one to the other, the more quickly do wooden structures become infested and destroyed. As considerable sums of money are to be expended to eliminate slums and to rebuild cottages for the poorer classes, the writer considers it his duty to call attention to facts which, unless they receive due and timely consideration, will greatly jeopardise the success of the slum clearance and reconstruction schemes.

As a result of remarks already submitted on this subject, the writer has been requested to give technical advice to the Central Housing Authority whenever he is asked to do so. The Secretary of that Board has shown interest in the matter, but the writer has not been informed whether the Board will give due attention to the problem he desires to bring to its attention. The writer consequently doubts whether this aspect of the question of slum clearance and rehousing has been fully appreciated. He therefore considers it his duty to express with insistence his apprehensions that the reconstructed areas will rapidly revert to slum standard unless due precautions are taken, and he trusts that before rebuilding is started on a large scale, he will be given opportunities to survey the sites and to study in detail the plans of construction so that he might be in a position to suggest means of insulating the wooden parts of the buildings from the menace of infested ground.

Experiments with Insecticides.

Termiticides and Wood Preservatives.—A number of chemicals and several proprietary products sold as wood preservatives were tested in connection with termite control and prevention of decays of lumber; sufficient time has not yet elapsed to allow for definite conclusions to be drawn.

Insecticides and Weed-killers to control pests infesting lawns, tennis courts, golf links.

Several species of cutworms, ants and many other insects which breed in grass are a constant source of worry and expense to all those interested in gardening or in sports such as golf, tennis, etc.

To deal with cases of severe infestation, the public always seeks advice from this Division. Whilst curative treatments have generally successfully controlled outbreaks of pests, the fact remains that, as those pests are detected after a fair amount of damage has already occurred, the appearance of the lawns remains temporarily spoilt. Moreover, to apply the necessary insecticides, trained labourers have to be employed and necessary materials are not always easily obtainable in time.

The control of Seymour grass and of several kinds of common and hardy weeds growing in lawns where only Bahama grass is desired, also causes recurrent and relatively heavy expense to those who possess lawns.

The problem of preventing infestation of lawns by pests or by weeds had therefore arrested the attention of this Division and whilst new methods and chemicals have been constantly tried out to secure improved results where specific pests were concerned, experiments have also been conducted with a view to discovering an economic method of treatment calculated to eliminate the more troublesome insect pests which commonly infest lawns, and to control weeds at the same time.

During the last two years, solutions of several brands of patented weed-killers, poisoned diluted molasses, dipping tank mixtures and chemicals such as Acetic acid, Iron Sulphate and Sodium Chlorate have been systematically applied in varying dilutions to adjacent plots where conditions permitted fair comparisons to be made.

Sodium arsenite in solution containing 1 oz. of the commercial salt in 6 gallons of water has proved to act as a selective poison which does not injure but even promotes the growth of Bahama grass, whilst after several applications the weeds are killed. Plots which received the last application of Sodium arsenite about 8 months ago have remained free of weeds, whilst the presence of insect pests and earthworms has not been noticeable.

Material for the treatment of a tennis court costs only 7/9.

Dissemination of Information of Entomological Interest.

Advisory work with regard to the control of pests affecting crops, stored products, etc., and identification of insect specimens submitted by the public have been continued. Lectures on entomological problems were delivered at meetings of planters, and contributions to the Journal of the Jamaica Agricultural

Society have been made. Advice on the following subjects have been published for the information of the public.

- "The Protection of Lumber used for the erection of Small Settlers' Houses, Barns and other Rustic Wood-work against Decay and attack by wood-boring insects."
- "The Use of Paints" in connection with the preservation of lumber.
- "The Control of Insects which Attack Wooden Furniture."
- "Some Insects Injurious to Trees generally grown in the Gardens of Jamaica."
- "The Brown Weevil Borer, *Metamasius sericeus*, as a pest of Sugar Cane."

Miscellaneous.

Attempts made during the last four years to grow *Pyrethrum* at high elevations in the Blue Mountain area have had to be abandoned. The plants grown during that time have never flowered. Planting on ridges leaving the crown root uncovered has not promoted production of flowers.

It came to our notice that in the Summary of the Plant Quarantine Restrictions for Barbados and in the United States Department of Agriculture Service and Regulatory Announcements, in portation of fresh fruits from Jamaica had been prohibited because it was thought that the Mediterranean Fruit Fly was present here. As this pest does not exist in Jamaica, steps have been taken to have this mistake corrected.

Two hundred and fifty suckers of the Smooth Cayenne variety of pineapple which had been growing at Hope were fumigated in the Laboratory before being transferred to the Government plot at Charlton.

The Entomologist acted as Government Botanist from the beginning of the year until 23rd March.

The Entomologist was on leave from the 28th October until the end of the year when the Botanist acted as Entomologist.

W. H. EDWARDS,
Entomologist.

(xv.) *Report of the Agricultural Chemist, 1938.*

SOIL INVESTIGATION.

1. *Rio Cobre Irrigation Extension.*

A scheme has been proposed to supplement the water available for irrigation in the Rio Cobre Irrigation Schemes so that additional areas may be watered. The main area of approximately 12 square miles situated to the north and west of Spanish Town has been surveyed in detail with a view to determining the quality and distribution of the soils in the district. The area is mainly in secondary bush following pasture. Some sections have been maintained in pasture and a few small patches are cultivated in sugar cane, beans and vegetables. Other sections of the area are already irrigated from the existing Rio Cobre supply.

The area forms part of the vast southern alluvial plain of Jamaica. The hills bounding it consist of white limestone, but their effect on the soil of the plain is very localized. A few minor outcrops of limestone occur on the plain. The soil of this section of the plain was originally laid down by the Rio Cobre; at a later date it appears to have been overlaid to a depth of 2-3 feet by swamp alluvium. Only in small sections of the area examined does the Rio Cobre alluvium appear on the surface. In this respect the formation of the area has followed that of the Vere area, where the alluvium from the Rio Minho has been overlaid by the swamp alluvium.

The surface layers of the swamp alluvium consist of a thin layer of dark brown or black clay frequently containing small shot. Underlying the surface layer is a pale yellow or putty coloured clay containing varying amounts of white quartz grit. The clay is plastic when wet and very hard when dry. Faint orange mottling sometimes occurs in the horizon immediately below the surface soil. These surface layers are in the north for the most part highly acidic (pH 5.0-4.5), toward the south they tend to become alkaline. The available nutrient content and the organic matter content are low. At a depth of approximately 3 feet the soils change to a coarse pale brown sand and there is little further change to a depth of 6 feet. Towards the south the clay layer becomes heavier and thicker. All soils of this type in the area contain sodium chloride. The maximum concentration occurs at a depth of 24-30 inches, where in the greater number of soils the content is more than 1,000 parts per million. This concentration would be sufficient to interfere with the growth of most economic crops. Gypsum is associated with the salt in most instances.

In the small area where the Rio Cobre alluvium has not been covered by the swamp alluvium, the soil is similar to, but somewhat lighter in texture, than the banana soils lower down in the plain. It has a fairly high fertility value.

The data for typical soils are as follows:—

PIT No. 2.

P.W.D. Land.—150 yards east of the Rio Cobre Main Canal; 250 yards south of the by-road, St. John's corner—Bog Walk-Spanish Town Road—Pasture, logwood, calabash, some 'guango', cherry, guinea grass; water logged appearance. *Soil:* Surface mottled fine sand overlying clay (with white grit) at 6 inches. (Grit increases in clay layer to depth of 12 inches and then decreases; gravel at 12 inches. Changes to a compact sand of varying coarseness at 38" containing traces of mica.

(1)*	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(a)	(b)	(c)	(d)
S.C. 389	Black, some shot	0-3	7.65	—	0.13	13.9	3.06	206	147	241	51.6	16.0	28.8	38.4
390	Dull yellow brown	3-6	7.30	—	0.11	10.4	2.03	318	70	561	35.2	14.0	48.8	54.8
391	Similar	6-12	5.45	—	0.08	11.0	1.44	485	495	825	43.2	10.0	46.8	50.8
392	Slightly paler	12-18	4.70	—	0.07	9.8	1.13	720	750	1,287	43.2	8.0	46.8	40.8
393	Similar	18-24	4.40	—	0.06	7.7	0.85	970	761	1,699	41.2	8.0	48.8	52.8
394		24-33	4.30	—	..	..	..	970	212	1,930	38.8	12.4	46.8	52.8
395		33-38	4.65	—	..	..	..	606	20	1,023	56.4	22.0	19.6	27.6
396	Lighter brown	38-51	4.80	..	..	..	..	540	107	858	50.0	28.0	18.0	28.0
397	Yellow brown	51-66	5.50	—	..	..	..	216	63	429	84.0	16.0	0	12.0
398	Few black specks	66-72	6.50	..	..	..	..	216	43	676	79.6	12.4	0	12.0

Available Phosphate Content (Surface 0-3" layer) = 61 parts per million of soil
 Available Phosphate Content 3-6" layer = 24 parts " "
 Available Potash Content 0-6" layer = 250 parts " "

- * (1) Soil Number (b) Silt.
 (2) Description. (10) Potential Fertility. (c) Clay.
 (3) Depth in ins. (11) Sodium Chloride in p.p.m. (d) Total Col-
 (a) Sand. loidal Matter.

2. *Estimation of Exchangeable Bases.*

The determination of the exchangeable bases of the major soil types of the Island has been commenced on typical soil profiles. Particular attention is being given to the causes for certain soils to pack on the surface after wetting. The packing is sufficient to reduce aeration in the soil and frequent surface cultivation is necessary if the maximum plant growth is to be maintained.

The exchangeable bases of the terra rossa soil type are being studied in relationship to the behaviour of crops growing on them. The results from the degraded terra rossa soils indicate that the exchangeable bases are concentrated in the surface soil. These soils should be susceptible to erosion and any removal of the surface layer will therefore rapidly reduce the agricultural value of the soils.

Included in these studies have been the exchangeable bases of the soils of the Clarendon Soil Survey area. The main soil types of the area have been included, viz:—

1. Recent Terra Rossa
2. Degraded Terra Rossa
3. Marine Clay
4. Hayes Beds
5. Minho Deposits
6. Black Calcareous Soils.
7. Milk River Alluvium.

Exchangeable manganese is concentrated mainly in the humic layer. The older terra rossa appears particularly deficient in exchangeable magnesium, while Marine clay and Hayes beds are particularly rich in this. Their high magnesium content may account for their field behaviour.

Exchangeable iron and aluminium are very high in the older terra rossa; this is also associated with high exchangeable hydrogen figures.

The Base Exchange figures are also available for the following profiles:—Caymanas alluvium, Spanish Honduras alluvium, an Inland Basin soil in St. Elizabeth and a red Trelawny Soil. The Caymanas and Honduras soils are interesting in that they are representative of the finest Jamaican and Central American banana soils.

3. *Organic Matter in the Soil.*

Preliminary investigations with regard to the decomposition of organic matter in the soil types, the old alluvium and terra rossa, have been commenced. Soils which have been under sugar cane for a number of years and are now being used for normal cropping and other soils which have been always under pasture are being studied.

Studies have been undertaken into the rate of loss of organic matter from two Jamaican soils—the Liguanea alluvium and the red soils from Manchester. The old alluvium is reputed to lose organic matter very quickly and the terra rossa, owing to its friable nature might also be expected to lose organic matter quickly. So far the results indicate that the rate of loss of organic matter from both soils is considerably less than was anticipated.

Investigations are being carried out on the effect of different cover crops on the nitrogen and organic matter content of the soil. The crops differ considerably in their effect. Preliminary investigations of the effect of various green manure crops on soil organic matter with particular reference to their nitrogen status are in progress.

The area of available agricultural land in Jamaica is limited and the agricultural population is increasing; the maintenance of the fertility of the available soil is therefore of primary importance and it is with this object that these investigations are being commenced.

4. *Soils from Experimental Areas.*

A detailed soil survey of the citrus experimental area at Grove Place has been completed together with a detailed soil survey of the corn experimental area at the same centre.

Regular samples from the banana manurial experiment have been obtained and examined in the laboratory.

5. *General Soil Examination.*

(1) *Advisory Work:* The examination of soils submitted by planters or obtained at their request has been continued. In the majority of cases the examination has been made with a view to determining the cause of indifferent plant growth, or in relationship to advice on fertilizer application.

(2) *Soils from Lower Clarendon:* A number of soils in Lower Clarendon and to the south of the area covered by the Irrigation Survey have been examined. The soils have been under irrigation and are producing sugar cane. The soils of one area are marine alluvium overlying Rio Minho deposits. The surface layer is considerably less acidic than those to the north of the plain. They contain varying amounts of sodium chloride and gypsum. The yields of sugar cane obtained from them lie below the average for the district. The soil of a second area examined consisted of recent river alluvium and is in the present flood plain of the Rio Minho. The soils are sandy loams, are fertile and calcareous and contain high contents of plant nutrients. They represent an area of much greater fertility than that of the marine clay.

(3) *Soils of the Old Harbour and Spanish Town Vegetable area:* In both these areas peppers, eggplants and tomatoes are the main crops and are cultivated under irrigation. In both areas the main trouble appears to be sensitivity of the skin of the fruit produced, especially eggplants and peppers.

The soils of the Spanish Town area fall within the area examined under the Rio Cobre Irrigation Scheme. This soil has a surface layer of 54% sand, is poor in organic matter and soil nitrogen and though it has adequate supplies of available potash, the available phosphate is low. Shot is common in the surface layer, indicating bad drainage, which is also probable in view of the heavy stiff clay underlying the surface layer. Though sodium chloride is absent from the surface layer, it is present in toxic amounts below six inches.

The Old Harbour area is situated 2½ miles west of the town on the main road from Old Harbour to May Pen. This soil is conglomerate alluvium, distributed by Clarendon Gully and by the flooding of this gully. The main soil is typical of a considerable area; the soil is highly alkaline, pH values greater than pH 8.4 being common. Organic matter appears to be a limiting factor of production and the soil would benefit considerably both chemically and physically by the use of some system of leguminous green manuring. If adequate drainage is not provided undesirable accumulations of salt may occur in the surface layers.

General Agricultural Analyses.

The following is a Summary of the samples examined in the Laboratory during the year:—

A. Banana Fertilizer Experiments Soil Samples	2,179	
B. Other Soil Samples	1,582	
C. Other General Laboratory Analyses:		
Bat Manures	22	
Fertilizers	15	
Cane Juices	69	
Molasses and Sugar Products ..	29	
Marls, Limes, Limestones ..	12	
Irrigation and Well waters ..	14	
Miscellaneous	14	175
D. Food Analyses:		
Beans and Peas	62	
Maize	54	
Miscellaneous	9	125
E. Plant Ash Analyses:		
Maize	20	
Beans	37	
Pawpaws	3	
Banana	75	
Citrus	6	141
Total samples examined	4,202	

The bat manure samples included mixed manures using bat manure as a base. The number of natural bat manures submitted was considerably less than in previous years. The majority of manures submitted were for checking against guaranteed analyses. Many of the results indicate that the importance of careful sampling and of careful mixing is not fully appreciated by planters. Samples obtained from the same batch of locally mixed fertilizer have varied considerably in composition.

Marls and limestones have been of uniform high quality. Some of the irrigation waters submitted have been highly saline. In one instance the salt content was more than half that of sea water. The owner of the well had not had his water examined until after he had spent considerable sums of money in planting out his fields.

FOOD CROP INVESTIGATIONS.

In 1937, a grant was made from the Colonial Development Fund for investigations into food crops in Jamaica extending over a period of three years. Two Senior Officers were appointed and assumed duty early in 1938.

The diet of the labouring classes in Jamaica includes a high proportion of starchy foods and is deficient in protein, the main object of the investigations is to decrease this ratio by encouraging the local production of protein containing foods. The local diet is deficient in animal and vegetable protein, but the scope of the investigations does not permit of a simultaneous study of methods for making both these protein types more readily available. Work for the present is being concentrated on investigations covering vegetable proteins. Many of the protein containing foods, such as beans, peas, maize and rice consumed in Jamaica are imported. The value of such foods imported in 1937 amounted to £187,721. It is believed that with suitable varieties and cultivation a large proportion of these foods could be produced locally at a cost less than that of the imported foods, and that if the people grow such crops themselves there will be a greater tendency to include them in their diet. The introduction of new crops will have advantages in addition to those immediately concerning diet. With a possible decrease in exports in the near future, anything which can be done to reduce imports would be advantageous.

The practice of rotational systems of agriculture will be essential under the extended Land Settlement system. The introduction of new crops should provide additional possibilities for the establishment of such systems. The investigations are concerned with the introduction of leguminous crops which should form an essential part of any sound agricultural system and which at present play no part in Jamaican agriculture.

The primary step in the investigations is to determine whether suitable legume and cereal crops can be grown sufficiently cheaply to compete with imported articles. The high cost of locally produced foodstuffs of this type compared with that of similar imported food is due mainly to the low yields obtained from such crops under local conditions and the high labour rates per unit of work. The yields may be increased and labour charges reduced by:—

- Improving methods of cultivation, using proper fertilizers and conserving soil fertility.
- Cultivating higher yielding varieties of those pulse and cereals already present in the Island.
- Introducing and determining the optimum conditions for varieties of pulse and cereals new to the Island.

It is with these objects in view that the initial experiments are being conducted.

There is little information available of the nutritive value of locally grown foodstuffs. Preliminary investigations have therefore included the determination of the nutritive value of these crops, together with observations on any variation which may exist due to climatic conditions or soil types. These preliminary investigations have indicated that in some instances the soil and fertilizer application can affect the composition of certain crops as well as the yield. Further investigations on the basis of these findings are being made.

The results of the first year's work under the scheme are incorporated in the following reports from the Senior Agricultural Superintendent and the Assistant Agricultural Chemist, who are concerned with this section of the work of the Division.

Report of the Senior Agricultural Superintendent.

Seed Supplies.—The first step taken in connection with the proposed programme of work was the collection, introduction and distribution of local and imported seeds of the various pulse, corn, rice and other economic crops; the number of samples of seed collected and received from local and overseas sources is indicated in the following table:—

	Local.	Overseas.	Total.
Beans, Peas and Soyas	101	175	276
Rices	3	17	20
Corns	9	24	33
Sorghums	..	14	14
Other Economic Crops ..	1	20	21
	114	250	364

Local supplies of seed were obtained through the medium of various officers of the Department and Instructors of the Agricultural Society; applications for supplies from overseas received a wholehearted response from the Colonial Agricultural Departments concerned, also from the United States Department of Agriculture.

Establishment of Centres.—In view of the diverse climatic and soil conditions which exist in the Island it was considered necessary to establish centres for testing out the various seeds throughout the Island. Centres were established at the following places during the year:—

- (1) Government Experimental Station, Hope, St. Andrew.
- (2) Government Stock Farm, Grove Place, Manchester.
- (3) Amity Hall, Vere, Lower Clarendon, (West Indies Sugar Co.)
- (4) Springfield Farm, Lower Clarendon, (West Indies Sugar Co.)
- (5) Meylersfield, Westmoreland, (West Indies Sugar Co.)
- (6) Dinthill Practical Training Centre for Boys, Linstead, St. Catherine.
- (7) Green Hill, Forestry Reserve, Nr. Newcastle, Portland.
- (8) Cockburn Pen, St. Andrew.

Of these centres work has been confined in the main part to Hope, Grove Place and Vere.

Activities at different Centres.—The general scheme of work followed out has been the same at each centre. The land was laid out in 1/40 acre plots and seed of as many as possible of the various crops planted for observation and multiplication purposes, with a view to further experimental work with the more promising varieties. A basic dressing of N.P.K. fertilizer at the rate of 4 cwts. per acre was applied to all plots. Difficulty was experienced in obtaining suitable and sufficient land representative of the soils of the different areas, while low rainfall during the year combined with labour troubles in all areas considerably handicapped progress.

The following is a brief summary of the work which has been carried out in the different areas.

(a) *Experimental Farm, Hope.* (Altitude 668 ft.)—Activities at this centre were confined to the establishment of plots of the various local and imported varieties of seed for the purpose of making preliminary observations on their growth and adaptability to local conditions and also for seed multiplication. One hundred and sixty-five varieties of beans and peas—including green manure and cover crops—forty-three varieties of Soya beans (*Glycine hispida*), seventeen maize varieties and thirty-one hill rices, sorghums and other economic crops, were planted up during the year. Certain of these crops show promise, but before coming to any definite conclusions further experimentation is called for. The total rainfall for this station was 40.56" compared with an average figure of 53.29"; owing to drought conditions irrigation water was not available until August. A record of diseases and pests affecting the different crops and their response to treatment has been kept.

(b) *Grove Place.* (Altitude 1,500 ft.)—One hundred and seven different varieties of beans, peas, corn and other minor crops were planted during the year. In addition, twenty varieties of soya beans were tested out, the seed of which was inoculated prior to planting. Yields obtained from certain varieties of soya beans at this station were more promising than elsewhere, possibly owing to the different soil, altitude and weather conditions. Further investigations, however, are necessary before arriving at any conclusions as to the possibilities of this crop.

Maize Fertilizer Trial.—This experiment was designed with the object of ascertaining the optimum fertilizer requirements of the corn crop on soils of the nature existing in the area. A 3 x 3 x 3 factorial experiment was adopted, using the confounded method of layout on fifty-four 1/40 acre plots. Planting took place in May with the Jamaica Red variety of corn and necessary fertilizer applications were made when the crop averaged one foot high. The crop was badly attacked by Corn Ear Worm (*Heliothis absol-ta*) which was controlled by dusting with lead arsenate and lime. Satisfactory yields were obtained and results indicated that small additions of Potash to the maize crop under the conditions prevailing at Grove Place increase the yield of this crop by almost twenty-five per cent.

The area of land on which this experiment was carried out was later planted up with two of the more promising varieties of soya beans with the object of ascertaining the residual effect, if any, of the fertilizer applied to the corn crop.

Groundnut (Arachis hypogaea) Fertilizer Trial.—This trial was conducted with imported groundnuts on sixteen 1/40 acre plots, in order to investigate the optimum application of general fertilizer mixture required by the groundnut crop. Applications of 7:10:12 N.P.K fertilizer mixture were given at the rate of 0, 2, 4, and 6 cwts. per acre. Yields obtained indicate that increases are obtainable from heavier dressings of fertilizer. This trial will be repeated on a larger scale in 1939.

Rainfall: A total of 71.51" of rain fell during the year, compared with an average of 83.05" for the years 1928-1937.

(c) *Amity Hall* (Altitude 33 ft.).—Seventy-five plots were planted up early in September with various beans, peas, green manure, cover and other economic crops; irrigation was carried out as called for. All plots, however, suffered a set back in October owing to lack of weeding due to labour troubles. No serious pests or diseases affected the pulse crops though some damage was done to certain varieties of *croton* by the larvae of *Uthetesea ornatrix* and leaf damage was caused to various *Dolichos* and *Phaseolus* varieties by *Ceratoma denticollis*.

Rainfall: A rainfall of 35.66" was recorded for the year, compared with an average of 41.67" for the years 1928-1937.

(d) *Springfield Farm*.—Activities at this centre were confined entirely to Rice.

(i) *Swamp Rice*: Fifty-four 1/40 acre plots were planted up with locally obtained short and long grained varieties. The paddy was soaked overnight and sown on the 11th and 12th July on a well puddled nursery seed bed. Transplanting took place when the plants attained a height of 18"-24". Three distances of planting were adopted; (i) the local East Indian method; (ii) the normal distances used in rice-growing countries with seedlings topped and planted 9" apart, and (iii) 18" apart. Irrigation was carried out nine times; harvesting and threshing started at the end of November. The following yields were obtained:—

Long-grained variety:

Planting Distance.	Av. gross yield paddy p.a.	Av. no. of plants p.a.
Local E. Indian method	.. 5,120	2,167
9 inch ..	.. 5,100	1,737
18 inch ..	.. 4,300	637

Short-grained variety:

Local E. Indian method	.. 5,180	2,755
9 inch ..	.. 5,040	2,040
18 inch ..	.. 4,520	748

(ii) *Hill Rice*: Fifty-four 1/40 acre plots were planted up with short grained local rice and No. 12 "Tsimakata" Hill Rice obtained through the Jamaica Agricultural Society from Madagascar. The seed was (i) dibbled, (ii) sown 4" or (iii) 8" in rows with eighteen inches between the rows. Germination was poor and considerable damage was done by rats. The growth of the crop generally was not as vigorous as with the rices grown under irrigation, which may be accounted for by the soil, which is of a heavy clay type, derived from marine alluvium and of neutral reaction.

The following yields were obtained:—

Distance of Planting.	Yield of paddy p.a.
Dibbling x 18" in rows	527 lbs.
4" x 18" "	457 "
8" x 18" "	390 "

(iii) Fifteen samples of various hill rices obtained from overseas sources were similarly planted. Yields were poor but sufficient seed was obtained from most samples for testing in other areas under more suitable soil and weather conditions.

Rainfall: 34.24" of rain fell at Springfield during the year compared with an average of 43.73" for the period 1924-1937.

(e) *Westmoreland: Meylersfield*.—Eighty-five plots were planted out with various beans, peas, hill rices and other economic crops during the month of September. Late planting due to labour disturbances, difficulty of supervision and lack of proper cultivation considerably handicapped work in this area.

Two varieties of local swamp rices, "Dubbi"—short-grained type, and "Rajal" a long-grained type, were planted on 14th September and harvested on 24th November and 10th December respectively. Yields of the rate of 2,240 lbs. paddy per acre were obtained. A further area of 2.2 acres, planted in October with surplus seedlings from Springfield Farm, Vere, and harvested on 21st December, yielded 560 lbs. per acre. This low yield may be accounted for by the lateness of planting, somewhat overgrown seedlings, the unusually dry season experienced, also the crop was not irrigated and some loss resulted from shattering.

(f) *Dinthill, Linstead*. (Altitude 400 ft. approx.)—(i) Forty plots were prepared for planting various beans, peas and other crops, but only a portion of these were planted owing to the dry conditions which prevailed. A rainfall of 47.26" was recorded at Dinthill, compared with an average of 70.22" for the district.

(ii) Thirty-eight plots were planted with potatoes in December. A small scale fertilizer experiment is being carried out on twenty-four of these plots, with the object of ascertaining the most suitable type and quantity of fertilizer for this type of soil.

(g) *Cockburn Pen*.—A small groundnut fertilizer trial was carried out with various combinations of N.P.K. fertilizer. A number of observation plots have also been established at this centre with the object of comparing yields, etc., with those grown in other areas.

(h) *Green Hill Forestry Reserve* (Altitude 4,000 ft. approx.)—Forty 1/80 acre plots have been established in order to try out various crops under different soil, climatic and altitude conditions.

(i) *Fertilizer Experiments with Local Edible Beans*.—A small fertilizer experiment was carried out at Temple Hall at the request of the Agricultural Society with three varieties of beans (*Phaseolus lunatus*) namely, Miss Kelly, Round Red and Imported American Red. The result of this experiment indicated that the local varieties were superior to the imported variety, while each gave higher yields for heavier applications of fertilizer.

Distribution of Seed.—Small quantities of seed have been distributed to officers of the Department for trying out as cover crops and for green manures under bananas, with the object of ascertaining how the varieties will grow under shade conditions.

Crop Return Questionnaire.—During the year forms were distributed to the Plant Disease Inspectors, and to Agricultural Instructors through the Secretary of the Jamaica Agricultural Society with the object of obtaining information relating to the crops growing in the different parishes and their yields. This information should prove of value in the event of an economic survey of the Island taking place.

SEED RECEIVED AT THE GOVERNMENT LABORATORY DURING 1938.

Andropogon arundinaceum
Boehmeria nivea
Cajanus cajan
Calopogonium mucunoides
Canavalia; vars.:—ensiformis, plagiosperma,
Cassia; vars.:—mimosoides, occidentalis
Centrosema pubescens
Ceratotheca sesamoides
Cicer arietinum
Cordeauxia edulis
Crotolaria; vars.:—anagyroides, incana, intermedia, juncea, lanceolata, maxillaris, retusa,
spectabilis, striata, usaramoensis, verrucosa.
Cucumis melo
Cyamopsis tetragonolobus
Digitaria exilis
Dolichos; vars.:—biflorus, lablab
Dipteryx odorata
Elaeis guineensis
Glycine max; vars.:—Virginia, Illini, Mansoy, Laredo, Harbisoy, Manchu, Trinidad,
Mammoth Yellow, Nanda, Easy Cook, Hahto, Jogun, Otootan,
White Biloxi, Biloxi, Haberlandt, Georgian, Palmetto, Charlie, Tokyo,
Table, Hokkaido, Imperial, Kura, Funks Delicious, White nonshatter,
Wh. Hermann, Otxi, Biltan.
Helianthus annuus
Indigofera arrecta
Lens esculenta
Melilotus; vars.:—indica, alba, officinalis
Mimosa invisa
Mucuna utilis
Oryza sativa
Phaseolus; vars.:—vulgaris, lunatus, aconitifolius, (latifolius), aureus, mungo.
Pyrethrum cinerarifolium
Sesamum indicum
Sesbania; var.:—macrocarpa, sericea, aculeata, tetraptera, leptocarpa, coespalecenes,
cinarescens.
Sorghum sp.
Stizolobium deeringianum
Tephrosia; vars.:—vogelii, candida, hookeriana, toxicaria, purpurea.
Trifolium; vars.:—repens, praetense, incarnatum.
Trigonella foenum graecum.
Vetiveria zizanoides.
Vigna; vars.:—sesquipedales, unguiculata
Voandzeia subterranea
Zea mays.

J. R. V. SMYTH,

Senior Agricultural Superintendent.

Report of the Assistant Agricultural Chemist.

A. PULSE CROPS.

A large number of different varieties of pulses are grown in the Island, though the numbers of different species is small. Hitherto, no information of the relative nutritive value of Island grown pulse crops was available, and the lack of information about variation in the mineral composition of most pulses is very marked. Evidence from published works indicate considerable variation in the nutritive value of different species and even of different varieties within a species. A similar variation is reported in the chemical composition of the ash which may be affected by the soil in which the crop is grown.

(a) *The Variation in Organic Composition.*—Fifty-three samples were analysed in duplicate representatives of eight kinds of pulses. The following is a summary of the results:—

	Moisture.	Ash.	Crude Protein.	Ether Extract.	Fibre.	Carbo-hydrate.
(1) Ph. Vulgaris (Red) ..	11.93	3.62 4.11	20.10 22.80	1.53 1.73	4.02 4.56	58.85 66.75
(2) Ph. Vulgaris (Imported) ..	12.60	3.84 4.30	18.81 21.06	1.55 1.74	2.88 3.23	62.19 69.55
(3) Ph. Vulgaris (Black) ..	12.42	4.54 5.18	19.94 22.77	1.82 2.08	3.49 3.99	57.79 65.99
(4) Ph. Lunatus (Lima) ..	12.52	3.97 4.53	20.34 23.25	1.14 1.31	3.66 4.18	58.06 66.37
(5) Ph. Mungo ..	10.59	3.59 4.02	20.29 22.67	1.23 1.36	4.94 5.52	59.37 66.36
(6) Ph. Aureus ..	10.30	2.88 3.21	24.35 27.15	1.98 2.21	5.02 5.09	55.47 61.80
(7) Dolichos Lablab (Bonavis) ..	11.86	3.74 4.25	20.25 22.97	1.66 1.88	5.25 5.96	57.24 64.98
(8) Vigna Catiang (Pigeon Peas) ..	11.53	3.87 4.53	18.17 23.25	1.68 1.31	5.43 4.18	59.43 66.37
(9) Vigna Unguiculata (Cow Peas)	12.20	3.66 4.07	21.53 24.52	1.63 1.85	4.21 4.79	56.86 65.29

The figures assess the nutritive values of the different legumes. Taking the crude protein per cent. of dry matter as a criterion it is evident that Ph. Aureus, a pulse which is little known in the Island is by far the best, whilst pigeon peas (Guango peas) which are very popular, have least protein. The detail figures for different varieties indicate that whereas Bonavis, pigeon peas and lima beans show only small varietal difference in protein contents, Ph. Vulgaris (Red beans) and cow peas show large varietal differences.

The figures available should therefore be of considerable value when the relative yields of the different pulses are known for the different soil types.

The average analysis of seven different varieties of soya beans grown at Hope is of interest compared with the above.

Moisture	Ash.	Protein.	Fat.	Fibre.	Carbo-hydrates.
11.90	5.76	35.82	17.54	1.02	28.04

Even at half the yield per acre of peas and beans soyas would still compare favourably with them as a fat and protein concentrate.

More detailed figures indicate that with soyas, too, chemical analysis should be consulted along with yield figures in ascertaining the variety grown, as considerable variation in composition exists between varieties.

(b) *Variation in the Ash Composition of Jamaican Grown Pulses.*—Eight of the chief Island pulses (Lima, White Sugar, Red, and Bonavis beans, Pigeon, Cow, Jerusalem, and Araba Dahl peas) were dry ashed at low temperature and their ashes analysed in duplicate. The following is a summary of the analyses:—

	C _a O % Ash	Fe ₂ O ₃ % Ash	P ₂ O ₅ % Ash
General Mean	7.78	0.23	18.85
Maximum deviation from the General Mean as a % of General Mean	125.7	134.0	35.78

Differences are well marked, Jerusalem peas which are particularly rich in Calcium, are poor in Phosphates, and Cow peas vice versa; while Bonavis beans are very rich in iron.

The figures, apart from assessing the mineral values of these crops, indicate their mineral requirements, and may help in deciding the soils on which these crops will be grown most successfully.

An attempt was made to find out to what extent soil differences could affect the chemical composition of bean ashes. The examination was confined to the Red Variety of Ph. Vulgaris and its modifications. In the following are quoted the mean values for each parish:

	% Ash.			% Whole Beans.				
	CaO	MgO	Fe ₂ O ₃	P ₂ O ₅	CaO	MgO	Fe ₂ O ₃	P ₂ O ₅
St. Andrew ..	5.36	8.44	0.25	2.31	0.186	0.298	0.0086	0.73
Portland ..	5.63	9.09	0.25	21.41	0.186	0.283	0.0073	0.74
St. Elizabeth ..	7.39	7.96	0.20	29.72	0.239	0.253	0.0073	1.02
St. Ann ..	6.07	8.28	0.26	23.42	0.179	0.245	0.0075	0.88
Mean ..	6.06	8.55	0.24	23.50	0.209	0.277	0.0077	0.823

The table bears out the reflection of soil compositions on bean ash analysis. There is some variation in calcium and phosphate content. The beans from St. Elizabeth in particular contain a high proportion of calcium and phosphate. The phosphate figures fluctuate with the calcium, whilst magnesium varies from being lowest in St. Elizabeth to highest in St. Andrew, i.e., inversely to the calcium figures.

B. THE ANALYSIS OF MAIZE FROM THE GROVE PLACE MANURIAL EXPERIMENT.

The experiment was laid out to observe the effect of different amount of N.P. and K in different combinations on the yields of maize on the red soils of Manchester. Whether or not yield is affected, it is reasonable to expect manurial treatment especially the application of nitrogen and phosphates to be reflected in the composition of the grain reaped, more especially in the protein content. Such effects have been observed in the protein and oil contents of soya beans in South Africa.

Samples of maize representative of each plot were obtained and analysed for moisture, protein, ash, fat, fibre and carbohydrates. Considerable variations exist within each chemical component, but these variations do not appear to be dependent on manurial treatment. There are indications however, that there is a relationship between phosphate applications and fat content. The mean analysis of maize is:—

H ₂ O	Ash.	Protein.	Fat.	Fibre.	Carbohydrate.
12.22	1.59	10.85	2.69	1.80	70.85

The 14 samples analysed for phosphate indicate very little variation, though the 24 samples analysed for iron showed large differences, some of which may be due to manurial treatment.

C. MISCELLANEOUS FOODSTUFFS.

Samples of cashaw pods, sunflower residues, mangoes, peanuts, cashew nuts, cashew apple, papaws, rice, lime trash and ackees have been analysed from a nutrition aspect. The sterol content of ackees maturing at different seasons was also estimated for the Island Medical Department.

The severe yellowing and wilting of cow peas on the red soils of Grove Place was investigated from an ash analysis point of view. The evidence indicates abnormal amount of Aluminium and iron in the ashe, as illustrated by the following:—

	Leaves.			Stalks.		
	Diseased.	Intermediate.	Healthy.	Diseased.	Intermediate.	Healthy.
Fe ₂ O ₃ % Ash	1.22	0.73	0.09	0.53	0.14	0.09
Al ₂ O ₃ % Ash	23.5	20.5	11.92	17.05	14.45	4.86

The analysis of peanuts from a fertilizer experiment at Grove Place is also being undertaken.

The Assistant Agricultural Chemist has also been responsible for the organization of the general laboratory work.

R. F. INNES,
Assistant Agricultural Chemist.

SUGAR CANE.

Cane Yield Survey.—A survey of the yields of sugar cane obtained from the island was continued in the 1937-38 crop.

The average yield of cane over the whole Island was 27.91 tons which is somewhat less than that recorded during the previous year. The low yield was in part compensated for by the high sucrose content in the cane. The amount of cane farmers' cane ground represented 25% of the total cane ground, and approached 300,000 tons. There was an increase of approximately 80,000 tons in the total amount of cane ground in the Island.

The proportion of the total cane area occupied by B.H. 10/12 and P.O.J.2878 varieties has remained at approximately the same as in the previous year. Together they occupy about 60% of the area of cane cultivation. Considerable interest has been maintained in the introduction of new varieties from Barbados.

One area of 28 acres of B.H. 10/12 yielded 85.9 tons of cane per acre following 18 months' growth

Sugar Factory Results.—The collection of weekly sugar factory reports from all factories has been continued. These reports are circulated to all factories. The yields of sugar expressed as tons cane required to manufacture one ton of sugar are given below:—

One ton of sugar is given below.						
Tons Cane per Ton Commercial Sugar for Crops.						
			1934-5.	1935-6.	1936-7.	1937-8.
1.	..	..	12.03	12.01	11.18	11.16
2.	..	..	10.81	10.13	9.84	10.54
3.	..	..	9.76	10.12	10.54	10.39
4.	..	..	8.94	9.56	8.93	8.20
5.	..	..	10.06	9.10	9.83	9.40
6.	..	..	9.26	9.35	9.17	9.08
7.	..	..	9.32	9.11	8.04	7.89
8.	..	..	12.42	13.26	13.75	12.44
9.	..	..	11.93	10.71	10.19	10.10
10.	..	..	9.32	10.32	8.98	8.78
11.	..	..	9.37	9.49	8.11	7.67
12.	..	..	10.04	11.49	10.03	9.48
13.	..	..	11.64	10.19	10.39	10.55
14.	..	..	10.13	9.72	10.67	9.75
15.	..	..	9.60	8.92	9.67	8.78
16.	..	..	9.15	10.06	10.78	10.44
17.	..	..	12.00	10.25	10.18	10.50
18.	..	..	9.66	9.57	10.31	10.12
19.	..	..	10.60	11.28	13.03	12.42
20.	..	..	9.93	9.50	10.62	10.11
21.	..	..	10.63	10.03	10.54	9.98
22.	..	..	11.60	11.60	12.60	12.07
23.	..	..	9.88	11.92	10.13	9.39
24.	..	..	10.68	11.69	10.61	10.01
25.	..	..	11.68	13.53	10.86	10.44
26.	..	..	11.21	10.86	11.45	11.28
27.	..	..	10.73	10.20	12.00	11.07
28.	..	..	11.43	10.72	10.52	11.09
29.	..	..	11.25	11.92	11.51	11.23
30.	..	..	11.80	12.13	14.17	12.75
31.	..	..	12.43	13.84	12.58	10.38
32.	..	..	10.25	11.07	9.89	10.34
33.	..	..	10.96	11.51	10.58	10.70
Avgs.			10.27	10.22	10.27	9.92

The average yield for the Island was 9.92 tons of cane per ton of sugar. For the first time on record two factories used less than 7 tons of cane to manufacture one ton of sugar as an average over the whole crop.

Sugar Advisory Committee.—One meeting of the Advisory Committee on the Sugar Industry was held during the year. The Committee was mainly concerned with the introduction of new varieties from the B.W.I. Central Cane Breeding Station in Barbados and the facilities available in Jamaica for the propagation testing and distribution of the seedlings when received. Recommendations on the matter were made to Government.

Jamaican Association of Sugar Technologists.—The Association held its annual conference in December which was well attended by members coming from all sugar estates in the Island.

Mr. A. C. Barnes, B.Sc., etc., was re-elected President of the Association and the Agricultural Chemist as Secretary. The conference followed the same lines as in the previous year and papers which covered the three main branches of sugar production were delivered. These were:—

“Some Considerations relating to the totally Electrified Sugar Factory.”

“Cane Farming, Present and Future.”

“Methods of Chemical Control In Jamaica and their Standardization.”

The Association has published a Quarterly Journal under the Editorship of Mr. L. B. Whitaker of Gray's Inn Central Factory. Three numbers of the journal contain contributions from members while the fourth is published as the Proceedings of the Annual Conference and the membership of the Association is now—

Honorary	..	31
Ordinary	..	77

Sugar Control Board.—The Sugar Control Board was appointed under The Sugar Industry Control Law, 43 of 1937. The Director of Agriculture was appointed Chairman and the Agricultural Chemist, Secretary of the Board. Fourteen meetings of the Board were held during the year. In the latter part of the year owing to the restriction of output under the International Sugar Agreement it became necessary to licence all cane farmers supplying cane to sugar factories. Registration of all cane farmers had been undertaken earlier in the year. As a result of experience in the 1937-38 crop the Board advised Government that certain amendments to the Control Law were desirable and these amendments were incorporated in the Sugar Industry Control Amendment Law No. 30 of 1938.

Field Experiments.—The total number of experiments which can be conducted is controlled by the staff available for supervising them. In accordance with the present policy the variety experiments were extended and the number of fertilizer experiments reduced.

The following is a list of experiments in progress:—

<i>Variety:</i>		
St. Thomas	Golden Grove Estate	2nd year
	Plantain Garden River	1st year
	Serge Island	new
St. Mary	(Grays Inn) Fort Stewart	1st year
	Richmond	new
Clarendon	Monymusk (2)	1 new
	Sevens	1st year
	Morelands	new
Westmoreland	Belleisle	3rd year
Trelawny	Hyde Hall	3rd year
	Swanswick	1st year
<i>Manurial:</i>		
St. Catherine	Worthy Park	2nd year
Clarendon	Morelands	new

BANANAS.

Fertilizer Experiments.—The fertilizer experiments undertaken by this Division and financed by the Fruit Companies have reached the end of their first stage. The experiments at the four main centres and certain subsidiary centres are laid out in randomised blocks. Detailed records and measurements have been kept throughout the life of the plant. Earlier work with fertilizers on bananas has been confined to the relatively fertile alluvial soils. The hillside soils on which these experiments have been performed afford a different combination of problems of which the present studies must be regarded as providing only the commencement of the solution. The results of the experiments have provided valuable information on the reaction of bananas to fertilizers, but this information can in no way be regarded as final or complete and many further investigations are necessary based on and amplifying the information already obtained. The detailed results of the experiments are in the course of preparation for publication and only a summary of the results is included in this report.

The main indications are as follows:—

- (1) Contrary to earlier belief in Jamaica, bananas respond to the addition of plant nutrients.
- (2) Whereas on alluvial soils results have been obtained only from nitrogen, on hillside soils reactions from nitrogen, phosphate and potash have been obtained.
- (3) Bananas respond to nitrogen on most soils in Jamaica, but only when adequate supplies of phosphate and potash are available.
- (4) The potash demands of the banana are high so that certain soils appear deficient in potash towards the banana. The high available potash content of many Jamaica soils determines their suitability for bananas. Certain soils are deficient in phosphate and reactions to its application can be obtained.
- (5) The application of excess phosphate in the absence of adequate potash tends to produce distorted fruit. The effect is counteracted by the application of the necessary potash.
- (6) Excess phosphate tends to induce leaf ripening. Potash tends to retard leaf ripening and to reduce the effect of certain fungoid leaf diseases.
- (7) Potash supply plays an important part in determining finger length.
- (8) Where nitrogen supply is one of the limiting factors, small applications of a nitrogenous fertilizer should be made frequently. Phosphate and potash may be applied at longer intervals, e.g., twice a year.
- (9) The effect of fertilizers on the fruit may be:—
 - (a) To increase the number of hands on the bunch.
 - (b) To increase the length of finger, i.e., the quality of the fruit.
 - (c) To decrease the time required to reach maturity.
- (10) It has been possible to establish tentative limits of adequacy for the amount of available phosphate and potash in the soil. For phosphate these are as follows:—
 - Below 5 p.p.m. reaction to phosphate application.
 - 5–10 p.p.m. probable reaction to phosphate application.
 - 10–20 p.p.m. possible reaction to phosphate application.
 - over 20 p.p.m. unlikely reaction to phosphate application.

The available phosphate has been estimated by extraction with dilute sulphuric acid.

The limits may vary somewhat for different soil types.

For available potash these are:—

- Below 150 p.p.m. reaction to potash application.
- 150–250 p.p.m. probable reaction to potash application.
- 250–300 p.p.m. possible reaction to potash application.
- above 300 p.p.m. unlikely reaction to potash.

The available potash has been estimated by extraction with dilute acetic acid.

Insufficient data are available on the limits of nitrogen conditions of the soil. It may be assumed, however, that with few exceptions an effect will be obtained from frequent applications of nitrogen provided the phosphate and potash condition of the soil is adequate.

In certain areas bananas receiving adequate supplies of nutrients did not appear to be so severely affected by leaf spot (*Cercospora musae*) as did those with insufficient supplies. Control by spraying or dusting was not attempted on these areas. After a period of fifteen months infection there is little or no difference in the incidence of the disease on bananas receiving different treatments.

The annual application of fertilizers per tree was as follows:—

Nitrogen—Quantities of Nicifos II and/or sulphate of ammonia equivalent to 2 lbs. sulphate of ammonia.

Phosphate—1 lb. Nicifos II.

Potash—1 to 2 lbs. sulphate of Potash.

The amounts of fertilizers used may not be the optimum as it has not yet been possible to conduct quantitative experiments.

St. Mary Fertilizer Experiments.—Owing to the reduction in staff of the Division these experiments had to be abandoned.

Banana Improvement Campaign.—Some three hundred demonstration plots using dust and artificial fertilizers were laid down during the year. On the basis of the results of the fertilizer experiments then available recommendations were made for fertilizer applications to the various soil types. No detailed records were kept of these plots, but observers report that where the incidence of leaf spot was not abnormal, the fertilizers caused improvements in appearance and yield.

Banana Ash Analysis.—The ashes of the various sections of a healthy banana plant growing on highly fertile soil have been analysed with a view to determining the nutrient uptake of the Gros Michel and the distribution of the nutrient through the plant.

The determinations were followed by analyses of leaves and ribs from bananas variously treated in order to investigate whether the mineral constituents of the leaf have any relationship to the nutrient supply in the soil. Comparisons have been made of the composition of the ash of leaves badly affected by cercospora leaf spot and from trees only slightly infected. There appears to be no differences. Similar determinations on leaves of resistant and non-resistant banana varieties are in progress.

CITRUS.

Grove Place.—The trees have been allowed to produce fruit for the first time. Records of the yield produced are not yet available. Detailed records of growth have been maintained. Pest control is being maintained under the advice and co-operation of the Entomological Division.

Wakefield Pen Experiment.—A sufficient number of suitable plants were made available during the year and the area has been planted out and sub-divided into plots in such a way to allow for a layout of 3 x 3 x 3 factorial design.

Miscellaneous Manurial Trials.—Manurial trials are being continued under the supervision of the Citrus Officer.

Leaf Ash Analysis.—Ashes of leaves from healthy citrus and from poor trees in the Grove Place Manurial Experiment are being examined.

LAND SETTLEMENT.

The Senior Agricultural Superintendent in conjunction with other officers of the Department undertook the inspection of certain properties offered to Government for purposes of Land Settlement and reported thereon. He reported also on the Agricultural Development of "Dinthill" Practical Training Centre, on behalf of the Education Department.

MISCELLANEOUS.

Staff.—The Agricultural Chemist was absent from the island on leave from 14th June until 31st October.

The Agricultural Chemist was appointed Secretary of the Sugar Control Board.

Mr. R. S. Martinez, Dip. Agric., Agricultural Superintendent attached to the Division was promoted to the Lands Department.

Mr. J. R. V. Smyth, M.A., Dip. Agric. (Econ.) Cantab., was appointed under the Colonial Development Fund Scheme as Senior Agricultural Superintendent. Mr. Smyth acted as Agricultural Chemist and Secretary of the Sugar Control Board during the absence of the Agricultural Chemist. Mr. Smyth was appointed to the Committee of the Dinthill Practical Training Centre.

Mr. R. F. Innes, B.Sc., A.I.C. Dip. Agric. Cantab., A.I.C.T.A., was appointed under the Colonial Development Fund Scheme as Assistant Agricultural Chemist. Mr. Innes acted as assistant external examiner at the Practical Examination in Chemistry for the Intermediate B.Sc. of London University.

Mr. C. D. F. Hutchings, B.S.A., was appointed as Junior Agricultural Officer under the Colonial Development Fund Scheme.

Messrs. H. M. Peterkin and R. K. Richardson were appointed as Junior Technical Assistants under the Colonial Development Fund Scheme.

Mr. L. E. Thwaites, Junior Technical Assistant, resigned to join the research staff of the West Indies Sugar Co.

Mr. O. W. Harrison, Technical Assistant, was promoted to the grade of a second class clerk.

Buildings.—A new wing to the Agricultural Chemist's laboratory, including additional laboratory, office and store accommodation, has been erected to accommodate the additional staff under the C.D.F. Scheme.

Publications.—

"Soil Erosion and Conservation in Jamaica—1937". Departmental Bulletin by H. H. Croucher & C. Swabey.

"A Summary of the Yields of Sugar Cane in Jamaica 1936-37." Departmental Bulletin by H. H. Croucher.

"Food Crop Trials under the Nutrition Scheme." Article in J.A.S. Journal—April 1938, by H. H. Croucher.

ACKNOWLEDGMENTS.

It is desired to record the appreciation of the co-operation and facilities afforded to the Division during the year by the West Indies Sugar Company, and in particular, by Mr. W. R. S. Ladell, F.I.C., B.Sc., Director of the Agricultural Research Branch, and his staff, also Mr. C. C. Michelin, Cultivation Officer.

Thanks are likewise due to the Superintendent of the Dinthill Practical Training Centre and his staff for their assistance in establishing observation plots at Dinthill.

H. H. CROUCHER,
Agricultural Chemist.

(xvi) *Report of the Botanist.*

I have the honour to submit hereunder my Report for the year ending 31st December, 1938. From 29th October to the end of the year I acted as Government Entomologist besides fulfilling the duties of the Government Botanist.

From the 1st January to the 22nd March I was absent from the Island on vacation leave. During this period the Entomologist acted as Government Botanist, and I wish to record my gratitude to him and his staff for the able manner in which the routine work of this Division was maintained in my absence. For the sake of completeness, details of work carried on in this period are included hereunder.

2. BOTANICAL WORK.

An increasing amount of work of a purely botanical nature has been dealt with during the year. This consisted mainly in the identification of weeds in relation to their control and of other botanical specimens submitted by planters and field officers of the Department.

3. STAFF.

Mr. L. B. Robinson who was appointed temporarily to act as Junior Field Officer attached to this Division in October last year has now been permanently appointed as Junior Agricultural Officer. Mr. D. A. L. Segre, Technical Assistant to the Division resigned his appointment on the 15th December.

BANANA BREEDING.

4. GENERAL.

The previous policy of 'carrying out' a limited number of 'crosses' on as large a scale as possible has been continued. The main activities of the Division during the year have been directed towards the general extension of the breeding work both by increasing the size of existing breeding plots, and establishing a number of new breeding stations, the objective being a greatly increased number of pollinations, and in consequence, a corresponding increase in the seedling output.

Weather conditions during the year have, in general, been satisfactory for breeding in spite of the fact that in a number of districts the rainfall was considerably below normal. The loss of pollinated fruit and breeding plants as the result of "Norther's" has been appreciably less than usual, the former amounting to approximately 2% of the total stems pollinated, most of which occurred on the plots at Potosi. In all, there was a loss of 5% of pollinated fruit, the balance being due to larceny. Early in December, heavy rains resulted in an unusual rise of the Wag Water River with the result that the breeding and variety trial plots at Coleraine were flooded for two days, fortunately no plants were lost and little damaged resulted. A 1-acre breeding plot of S.19 seedlings was blown down in August, and it has been replanted.

A summary of pollinations, etc., is given below in Table I. Figures given under "Seed Obtained" and "Seed Germinated" include seed from pollinated fruit unripe at the end of 1937, and seedlings from seed planted in the same year. The final column includes only those seedlings which have been planted out in the field. At the end of 1938 there were 306 young seedlings remaining in pots and seed boxes. These will be planted out during 1939.

TABLE I.

Year.	Stems Pollinated.	Seed Obtained.	Seed Germinated.	Seedlings Established.
Prior to 1934	..	..	..	52
1934	.. 1,472	.. 650	.. 56	1
1935	.. 1,957	.. 896	.. 253	81
1936	.. 2,260	.. 784	.. 191	172
1937	.. 3,132	.. 1,686	.. 428	169
1938	.. 3,397	.. 2,374	.. 516	312
Total	12,218	6,390	1,444	787

The steady extension of breeding work in progress is reflected in the increased number of pollinations carried out. A further increase is to be noted in the proportional seed yield, 10 pollinated stems have, on an average, given 6.9 seeds as against an average of 4.5 for the 4 previous years. A slight, but not serious fall in the percentage of germination is to be noted. Of the 312 seedlings established in the field, 184 were young seedlings held over from the previous year.

In Table II below these figures have been adjusted to give the actual returns of seed and seedlings from the fruit pollinated in any particular year.

TABLE II.

Year.	Stems Pollinated.	Lost.	Reaped.	Fertile.	Percentage Fertile.	No. of Seed.	Seed per Fert. stem
1934	1,472	64	1,408	184	13.07	911	4.95
1935	1,957	418	1,539	158	10.27	616	3.90
1936	2,260	201	2,059	281	13.65	1,127	4.01
1937	3,132	247	2,885	609	21.11	1,722	2.83
1938	3,397	154	1,829	560	30.62	1,917	3.41

In regard to 1938 it is to be noted that 1,414 pollinated stems remain to be reaped, and these should give some 1,500 seed. 53.5% of the stems pollinated were reaped by the end of the year. A marked increase in seminiferous stems has resulted in a considerable increase of seed production. As, however, an unusually high proportion of fruit remained unreaped at the end of the year, these present increases are even less than they will finally prove to be. The low value of seed per fertile stem in the last two years is in all probability due to the temporary shortage of pollen in newly established breeding plots.

Breeding has been continued on all plots which were in operation last year. The wild *Musae* which were planted on two new plots at Brimmer Hall and New Yarmouth in 1937 flowered this year, and breeding was commenced at Brimmer Hall in August. Owing to the poor vitality of the wild type *Annam* which was planted at New Yarmouth, insufficient pollen has been available to commence breeding there, and planting of this variety will shortly have to be extended. In line with the general policy of expansion, 4 more breeding stations have been set up at Fellowship and Chepstowe in Portland, Guy's Hill in St. Mary, and Boro-bridge in Clarendon; one of these has come into operation. No changes in pollination technique as described in previous reports have been made. Table III summarises the breeding activities at the various plots.

TABLE III.

Plot Summary, 1938.

Plot.	Stems Pollinated.	Lost.	Reaped.	Fertile.	Seed Yield.	Germinations.
Castleton ..	216	3	144	26	202	19
Toms River ..	140	9	95	36	131	28
Gibbs Hill ..	189	4	108	27	175	11
Coleraine ..	117	1	111	22	129	18
Orange Hill ..	472	57	223	107	550	82
Crawle ..	695	0	411	54	323	64
Grantham ..	720	10	356	97	197	41
Potosi ..	423	66	195	75	135	50
Chepstowe ..	129	3	54	10	43	..
Brimmer Hall ..	70	1	6	6	32	..
Hope ..	226	0	126	100	..	..
	3,397	154	1,829	560	1,917	313
Immature at 31.12.37	921	62	859	211	457	203
Total ..	4,318	216	2,688	771	2,374	516

Castleton.—No extensions to these three plots have been made. Crosses undertaken previously have been continued and at Castleton itself more extensive use has been made of *Calcutta*/4 as a male parent. This has resulted in a somewhat higher proportion of seed and seedlings. The gradual encroachment of Panama Disease on the *Highgate* plot at Toms River has reduced the number of pollinations carried out there and the seed yield. It is proposed to replace this plot by a new one on healthy land and to replant the Toms River plot with immune seedlings for breeding. The *Highgate* plot at Gibbs Hill was very late in shooting owing to the plants not having been pruned and only $\frac{2}{3}$ of the plot had shot by the end of the year. The seed output has been satisfactory here though the germination is not as good as usual. The *Giant Plantains* which were being crossed at Gibbs Hill with S.19 have been eradicated as no results were forthcoming. The one plant of the wild type *Samoa* has not yet shot again. 12 seedlings from the self-pollinated inflorescence of this variety have been planted here, and should enable further crosses to be carried out next year.

Coleraine.—The falling off of the number of pollinations is due partly to the use of seedling fruit in cold storage experimentation, and partly to the seedlings growing too tall to be accessible to the pollinators. As mentioned above, 1 acre of S.19 on these plots was blown down on the 27th August. These, together with a half-acre plot of S.17 have been replanted for pollination next year. The principal cross which has been carried out at Coleraine is S.19 x S.19; of the newer *Highgate* crosses, J.202 and J.208 have also been used on S.19 and some seed has been set.

At Orange Hill the number of pollinations has been maintained in spite of the encroachment of Panama Disease in the *Gros Michel* bananas there. The higher seed yield is due principally to the use of more fertile crosses. The backcross of S.19 to *Gros Michel* having continued to prove infertile has been discontinued; no germinations of the 38 seed yielded this year have occurred. Losses of pollinated fruit have been high at Orange Hill (12%) partly due to the blow-down in August (3%), and mainly to praedial larceny (8%). In the past, it has been the practice to allow pollinated fruit to hang until it commences to colour and it has therefore proved an attraction to the casual thief; recently, however, pollinated fruit has been reaped at the full $\frac{3}{4}$ stage, with the result that these losses have been falling off. No extensions to the breeding plots in this section have been made though the nursery plots and disease test plots have been extended.

Crawle.—No change in the crosses or acreage has been made here. Owing presumably to more favourable climatic conditions, a considerably higher output of seed has been forthcoming than in previous years.

The seed yielded in 1938 was 323 as compared with 21 in 1937, and 64 germinations have resulted. Owing to the poor results in the past, the highly fertile backcross of S.19 to *Calcutta 4* was carried out reciprocally as a test of the general suitability of the district for breeding. 44 stems pollinated yielded 2,576 seed which indicates that the poor results in the past have been due to an infertility of the crosses rather than to unsuitability of the locality.

Grantham.—This plot was extended to 3 acres towards the end of the year, a corresponding increase in pollinations and a proportional increase in seed and seedlings resulted. The same crosses as previously have been carried out using *Musa acuminata* and *Calcutta 4* pollen on *Gros Michel* and *Calcutta 4* on *Highgate*. The seed yield from *Highgate* crosses has been disappointing and this variety has not proven as fertile as *Gros Michel* in this district; nevertheless, the *Highgate* plot has been extended by approximately a quarter acre. It is possible that as the *Highgate* plot is situated near an exposed hilltop, the poor results are attributable to the desiccating effect of winds, and unless the situation improves shortly this plot will be transferred to a more sheltered situation.

Polost.—The 3-acre extension to this plot which took place at the end of the year is not yet reflected in the number of stems pollinated. *Calcutta 4* has continued to give good results, 135 seed and 50 seedlings as compared with 22 and 6 respectively last year and is now being used exclusively. The original cross *Gros Michel* x *Musa brachycarpa* has been abandoned and, as in the case of the plots at *Crawle*, previous failure to set seed must be attributed to the cross rather than the climate.

Chepstowe.—This 1-acre plot of S.19 was planted in 1937 to supply fruit for cold storage experimentation, but proved a failure for that purpose owing to the poor grade and weight of the stems. It was, therefore, extended to approximately $2\frac{1}{2}$ acres of the same variety and breeding was commenced in May. 54 pollinated stems had been cut by the end of the year and yielded 43 seeds; the locality therefore promises to be suitable for breeding. As the first seed was not obtained until the 28th November, insufficient time had elapsed by the end of the year for any germinations to have taken place.

Brimmer Hall.—This, another new breeding plot in St. Mary, consists of 3 acres of *Gros Michel* which are being crossed with the wild variety *Pisan Lilan*. Pollinations were commenced early in August and 6 stems were cut by the end of the year. All of these proved fertile and yielded 32 seeds. This phenomenal yield promises good results on this plot. Again, the seed were obtained too late for germinations to have occurred.

Hope.—No change in the breeding acreage has been made. The backcross of seedlings to the wild type (*Musa acuminata*) to test the viability of seedling pollen has been continued, and 126 stems reaped have yielded 27,511 seed. As this seed will not give seedlings of economic importance or sufficiently fertile for further breeding, these together with the 2,576 seeds from *Crawle* mentioned above have not been included in the tables.

The new plots which have been laid down at Fellowship, Guys Hill and Borobridge which had not come into operation by the end of the year are designed for the extension of the F-2-cross, S.19 x S.19.

5. BREEDING LINES.

The same breeding lines as those in operation during 1937 have been carried out with some modification and additions during the year under review. As mentioned above in reference to the work in progress on the various plots, certain crosses which have proved insufficiently fertile have been eliminated from the programme. Table IV summarises the crosses in progress and results from them during the year. Figures in the column headed "Seed obtained—1937" refer to seed from stems pollinated in 1937 but reaped this year.

TABLE IV.
Summary of Crosses, 1938.

Cross.	Stems Pollinated.	Lost.	Reaped.	Fertile.	Seed obtained		Seed Germinated.
					1938.	1937.	
J.* x M. acuminata A ..	506	10	273	75	139	42	65
J. x " B ..	235	9	169	46	154	45	51
J. x M. brachycarpa ..	84	11	69	6	20	3	13
J. x Calcutta/4 ..	1,360	100	621	229	763	279	241
J. x Pisan Lilan ..	70	1	6	6	32	..	..
J. x F1 ..	207	15	133	10	38	..	..
F1 x F1 ..	650	5	382	80	763	88	132
Sundry ..	285	3	176	108	8	..	14
	3,397	154	1,829	560	1,917	..	313
Immature at 31.12.37 ..	921	62	859	211	..	457	208
Total ..	4,318	216	2,688	771		2,374	516

Note.—J* (Jamaica) includes the type, *Gros Michel* (G.M.) and also *Highgate* (H.), *Pink Jamaica* (P.J.), *Plantain Jamaica* (Pl. J.), *Weeping Jamaica* (W.J.), *Glengoffe* (G.G.), and *Freehill* (F.H.)

No extensions to the *Highgate* plots having been made, the number of stems pollinated is very similar to that of last year, and comprises about 1.5 of the pollinations with the female parent *Jamaica* (J.); this variety has not proved as fertile as *Gros Michel* giving only about 30% as much seed, nevertheless, germination is satisfactory and a steady supply of seedlings is being obtained.

As previously stated, the crosses commenced last year using S.19 pollen on the *Giant Plantain* variety have been abandoned as no seed was obtained although the cross was being carried out at Gibbs Hill, a plot where other lines were giving satisfactory yield. This again is one of those crosses which are infertile. Pollinations with *Musa acuminata* (Clones A and B) have been carried out on a similar scale to last year and comparable results as regards seed yield have been forthcoming. The use of Clone E of this species has been discontinued owing to unsatisfactory results; its pollen is less fertile and a high proportion of useless heptaploids occur in the seedlings. For similar reasons *Musa balbisiana* var. *brachycarpa* (*M. sapientum*) has been eliminated from the programme. With this species, a very small percentage of pollinated fruit set seed, and all but 2 of the seedlings from the few seed which had germinated died in the seed box.

The most noteworthy feature during 1938 was the great increase in the use of *Calcutta/4* pollen. 1,364 stems were pollinated with this variety compared with 402 last year. So far as the seedling output is concerned, this extension has been justified as 142 seed have germinated, a similar percentage to last year. Whether the seedlings which are being raised from this cross will prove to be of economic value remains to be seen, a number of these seedlings have been planted out, but none have yet borne fruit.

It has not yet been possible to do any further breeding with *Samoa* as the one stool of this variety which has been established in the field has not yet shot its first ratoon, but it is hoped to obtain sufficient pollen to carry out a number of crosses with this variety next year. *Pisan Lilan* came into use at Brimmer Hall and, as mentioned above, has given a highly satisfactory yield of seed. This cross is of interest owing to the fact that *Pisan Lilan* is parthenocarpic and though its fingers are of the *Musa acuminata* type, they are better developed than other varieties of that species.

Backcross.—There is little likelihood that either backcross will yield seedlings of value, either economic or for further breeding. The backcross of tetraploid seedlings to the male parent (diploid) produces a progeny which approximates very closely in its phenotype to the wild type, and lacks practically all the desirable commercial characteristics. This progeny, furthermore, is triploid and therefore highly sterile. It only sets seed very rarely even when crossed with a diploid wild type.

The backcross to the triploid female parent has now been continued for 5 years. 3,068 stems (approximately 300,000 flowers) of the different varieties of the *Jamaica* banana have been pollinated with pollen from various tetraploid seedling varieties. 109 seeds which have resulted have given only 12 seedlings and none of these show any economic promise. The majority of these seedlings approximate to the pentaploid condition, are in consequence highly sterile and thus of little practical value for further breeding. These crosses have therefore been virtually abandoned.

A large number of seed was set in 4 bunches out of 12 of *Calcutta/4* which were pollinated with *Highgate* pollen. Such crosses have not been carried out before owing to the difficulty of collecting sufficient pollen from the triploid varieties and to the poor germination of this pollen *in vitro*. It is possible that this seed is due to accidental self pollination of *Calcutta/4* but germination has been good and seedlings are being kept under observation.

F2-cross (e.g., S.19x S.19).—650 stems have been pollinated as compared with 604 last year, those reaped have given a high seed yield and a fairly good germination—132 seedlings. This cross is to be further increased on the new plots laid down at Fellowship, etc., where the particular cross will be S.19 x S.19. As suckers of some of the newer selected seedlings such as J.194, 208, become available, these varieties will be planted on these plots and crossed with S.19.

6. GERMINATION.

516 Seeds have germinated during the year, 313 of these were planted this year, and 203 last year. These germinations are listed below:—

	<i>Jamaica</i>	x	<i>M. acuminata.</i>		<i>Backcross.</i>			
G.M.		x	Clone A	43	S.19	x	Calcutta/4	12
P.J.		x	Clone B	44	Calcutta/4	x	S.19	1
H.		x	Clone B	3	<i>F2</i>			
		x	Clone A	23	S.19	x	S.19	129
		x	Clone B	4	S.19	x	J.208 (?)	3
	<i>Jamaica</i>	x	other spp.		<i>Miscellaneous.</i>			
G.M.		x	<i>M. brachycarpa</i>	12	Gt. Plant	x	M. acum.	1
		x	Calcutta/4	237				
H		x	<i>M. brachycarpa</i>	1				
Calcutta/4		x	H	3			Total	516

The majority of the seedlings have come from the crosses J. x *Musa acuminata*, J. x *Calcutta/4* and S.19 x S.19. 82 of them died in the seed box stage and 128 have been planted out in the field. Of the 306 remaining, 155 were thick leaved dwarfs (approximate heptaploids) of little value and will be discarded; there therefore remain 151 to be planted out next year. The percentage of germination of all seed planted during the year is 21.8 which is slightly less than that of the two previous years, 25.5 and 27.3 respectively, but is nevertheless fairly satisfactory.

A number of germination experiments have been carried out to test the loss of viability of seed stored under various conditions of humidity. It has been found that *Musa* seed stored in a dry condition rapidly loses its viability, and in view of recent importations of wild seed necessitating a journey lasting a fortnight or more, it has been thought desirable to commence these experiments with a view to discovering a more satisfactory method of packing. These experiments are still in progress and a separate report will be submitted when they are complete.

7. NEW SEEDLINGS.

In addition to the 128 seedlings mentioned in the previous paragraph, a further 184 which germinated in 1937 have been established in the field making a total of 312 as follows:—

		<i>Jamaica</i> x <i>M. acuminata</i> .		<i>Backcross</i>			
G.M.	x	Clone A	33	G.M.	x	S.19	1
	x	Clone B	13	F2			
P.J.	x	Clone B	19	S.5	x	S.19	7
F.H.	x	Clone B	5		x	19	1
H.	x	Clone A	36		x	19	1
	x	Clone B	7		x	19	2
					x	19	117
		<i>Jamaica</i> x other spp.					
G. M.	x	<i>M. brachycarpa</i>	1				
	x	Calcutta/4	68				
H.	x	<i>Samoa</i>	1				
						Total	312

This shows a satisfactory increase over the 169 planted out last year. 138 of the 1936-37 seedlings have borne fruit as also have 7 of the 1938 seedlings planted early in the year. 165 seedlings stems, of which 58 shot in 1937, have been reaped and recorded. Sufficient fruit from the more prolific crosses is now available to estimate the immediate value of those crosses. A separate report on this aspect of the breeding work is in preparation for publication.

TABLE V.

1938 Seedlings.

Cross.		Seedlings Shot.	Seedling stems reaped.	Un- promising.	Further Trial.	Promising.
<i>F1-generation.</i>						
G.M.	x Z.A.*	23	30	16	14	4
	x K.	..	1	1	..	..
H.	x Z.A.	5	..	..	..	..
	x K.	9	20	7	13	9
P.J.	x K.	1	1	1	..	..
F.H.	x K.	2	1	1	..	..
Miscellaneous		2	1	1	..	..
<i>Backcross.</i>						
G.M.	x S.19	2	3	3	..	..
F2.						
S.5	x S.7	1	6	6	..	..
7	x 7	6	5	4	1	..
	x 19	2	7	7	..	..
19	x 7	..	1	1	..	..
17	x 19	2	4	4	..	..
	x 20	1	1	1	..	..
19	x 19	70	58	52	6	2
20	x 7	4	7	7	..	..
	x 19	1	2	2	..	..
24	x 19	2	1	..	1	1
39	x 19	1	..	..	..	..
40	x 7	1	1	1	..	..
118	x 19	2	1	1	..	..
S.	x 7	3	2	2	..	..
	x 19	5	12	11	1	..
Total		145	165	129	36	16

Note.—*Z.A.—*M. acuminata* Clone A; K—*M. acuminata* Clone B; C4—Calcutta/4, S.5, 7 etc.—tetraploid seedlings.

The above table summarises the various seedlings produced and analyses them according to the promise of commercial value they show. The figures are very similar to those for last year. The F1-cross produced approximately twice as many promising seedlings as the F2, 85% of which present no attractive commercial features. All these seedlings however will be retained to test their reaction to Panama Disease and subsequently to breed out recessive characters of commercial value. The *Highgate* derivatives continue to show most promise as regards fruit grade and weight though they are still short in the finger. Among the F2 seedlings an occasional long fingered one crops up, but this characteristic is invariably associated with poor grade and light weight in this family.

TABLE VI.
1938 Selections.

Cross.	Variety.	Number of stems.	Weight lbs. ozs.	Hands.	Fingers per hand.	Finger wt. gms.	Finger length inches.
G.M. x K. (?) H. x K.	Gros. Michel	12	45 - 15	7.5	15.0	155.4	6.72
	Highgate	10	51 - 8	9.1	15.2	153.7	6.07
	S. 19	10	28 - 13	6.5	14.4	114.4	5.69
	J. 203	4	49 - 13	9.0	17.7	116.5	5.23
	J. 309	1	24 - 12	6.0	15.5	121.9	5.40
	J. 311	1	47 - 0	8.0	14.1	166.3	5.36
	J. 323	1	37 - 0	8.0	17.2	104.3	5.22
	J. 358	1	32 - 8	6.0	15.0	137.4	5.14
	J. 417	1	29 - 8	8.0	14.2	101.8	4.94
	J. 418	1	37 - 14	9.0	14.6	113.4	4.98
	J. 419	1	30 - 4	7.0	16.3	99.0	4.82
	J. 450	1	40 - 0	8.0	14.4	136.8	5.25
	J. 360	1	25 - 4	7.0	12.9	105.8	5.87
	J. 422	1	38 - 0	7.0	16.1	125.1	5.64
	J. 423	1	33 - 0	6.0	15.3	127.9	5.70
S. 19 x S. 19	J. 455	1	43 - 0	8.0	16.9	119.8	5.74
	J. 393	1	18 - 0	7.0	13.4	64.8	4.88
S. 24 x S. 19	J. 402	1	25 - 0	7.0	17.1	72.6	4.33
	J. 428	1	25 - 13	8.0	11.1	117.5	5.39

The weight, grade, number of fingers and finger length of the above 16 selected seedlings are very similar to the 1937 selections, and call for little comment. Again it will be noted that they compare very favourably with *Gros Michel* in all characteristics but finger length. The fingers of even the best of the seedlings are at least 1 inch shorter than those of the *Gros Michel*. J.311 of which the fingers are heavier than those of the average *Gros Michel*, in common with other seedlings of the H. x K. group carried fingers which are shorter than those of the latter variety but are considerably fatter.

The F2-cross has produced no promising seedlings this year, but the families are still too small for a reliable estimate of their possibilities to be made. So far only 55 stems have been reaped from seedlings of the cross S. 19 x S. 19.

The 1936 and 1937 selections are in process of being bulked and those which have re-shot have borne similar fruit to their original plants, particularly in the case of J. 194. A second stem of J. 228 has shot but the fingers are $\frac{1}{2}$ inch shorter than in the original plant. None of these seedlings have produced fruit in sufficient quantity for an estimate of their average characteristics to be formed. Two of these selected seedlings, J. 180, J. 285 have succumbed to Panama Disease.

8. PLANT INTRODUCTIONS.

With the co-operation of the Agricultural authorities in other tropical, particularly eastern countries, a number of wild *Musae* have been collected and seed of these were received in Jamaica towards the end of the year. They are being grown to determine their value as immune fertile parents for breeding. Seed of the following 32 species, many of which are unnamed, was received by the end of the year:—

Variety.	Germination.	Variety.	Germination.
<i>Musa flava</i> ..	Good	Hpu-gyaing-nget-pyaw 1	Poor
<i>Musa Hombiei</i> ..	None	“ “ “ 2	Poor
<i>Musa errans</i> ..	Poor	Taw-nget-pyaw-gyi	Fair
<i>Musa sanguinea</i> ..	..	Ngapyaw-nwe ..	Good
<i>Musa textilis</i> ..	..	Tawbyaw ..	Good
<i>Musa zebrina</i> ..	..	Pisang Awak Legor	..
<i>Musa zebrina</i> var. <i>cerifera</i> ..	..	Burma No. 9 ..	Good
<i>Musa brachycarpa</i> ..	..	New Guinea Nos. 1, 10-15	None
Nat-nget-pyaw ..	None	“ “ Nos. 6, 7	Poor
Maidaw-letnyo-nget-pyaw ..	None	“ “ Nos. 2-5, 8, 9	Good

On the whole, germination has been sufficiently good, and most of these types will be established, grown under observation, and if suitable, used for breeding. Several of the varieties listed, such as *M. textilis* are already existing in Jamaica, and the seed received was not planted. A number were received from New Guinea in December, too late for germination to have occurred by the end of the year.

Of the two varieties, *Pisan Lilan* and *Annam*, introduced from Trinidad last year, the former has grown vigorously and is being used for breeding with considerable success, in regard to seed yield, at Brimmer Hall. *Annam* has grown poorly, and it has not yet been possible to use it for breeding on any scale.

Of the several varieties obtained from Honduras in 1937, 6 have proved to belong to the same species as *Musa brachycarpa*, a variety of *Musa balbisiana* (*M. sapientum*). This variety has proved a failure in breeding and in all probability the 6 others will prove so too. One of the Honduras varieties is a sterile parthenocarpic form closely resembling *Robusta* and does not produce pollen in sufficient quantities for breeding; 2 were apparently forms of *Musa acuminata* and show no advantage over the clones of that species already in use. Seed of two varieties from the same source germinated well and these have been established at New Yarmouth, one has proved to be a form of *Musa balbisiana* and the other *Musa textilis*.

No new variants of *Gros Michel* had come to light during the year. A sucker of one possibly new type was presented to the Department for comparison with existing types and is still under observation.

6 suckers of the seedling I.C.2 were received in March from the Imperial College of Tropical Agriculture, Trinidad, and are under comparison with local seedling varieties.

MUSA CYTOLOGY.

A number (approximately 128) of chromosome counts of seedlings have been made during the year, and these bear out counts made previously. They are summarised in Table VII below; in reference to this table, it should be borne in mind that the female parents *Gros Michel* and *Highgate* are triploid, and the wild type males *Calcutta/4*, *Samoa* and *Musa acuminata* diploid, and seedling parents tetraploid. It will be noticed that the majority of the seedlings are euploid, being triploid, tetraploid or heptaploid. These results confirm the counts and conclusions published in previous reports.

TABLE VII.

Somatic Chromosome Numbers.

2n		22	33	41	42	43	44	45	46	48	55	71	75	77	81
G.M.	x K.	..	..	..	..	..	1	..	..	..	..	..	2	6	1
	x Z.A.	..	..	..	..	..	10	..	..	..	..	1	1	10	..
	x C4	..	..	..	..	..	6	..	..	..	..	..	..	..	..
H.	x K.	..	..	..	..	1	4	..	..	1	..	..	..	..	..
	x Z.A.	..	1	..	..	..	16	..	..	..	1	..	..	..	..
	x Samoa	..	..	..	..	..	1	..	..	..	..	..	..	..	..
F1	x K.	..	7	..	..	..	..	..	..	..	..	..	..	..	..
S.19	x S.19	..	1	..	1	5	43	3	1	..	..	..	..	..	..
other		..	..	..	..	..	..	..	..	..	..	..	..	..	..
F1	x F1	..	2	1	..	1	10	..	..	..	..	..	..	..	..
Total		..	1	10	1	1	7	91	3	1	1	1	3	16	1

10. VARIETY TRIALS.

The system of developing banana varieties which is in progress involves growing the original seedling until the plant bunch has been shot and reaped. The 4 or 5 suckers which are thus developed as a rule are divided into two batches, one of which is planted in diseased and one in healthy land, and they are there grown for a second generation. The stools are then taken up and replanted and at the end of the third year from 70 to 120 suckers have been produced. Sufficient suckers of a limited number of the 1936 selection however became available for laying out a 4x4 Latin square variety trial, which was planted in September. Having a limited number of suckers available, it was not possible to include more than 12 plants per plot, and it is probable that this experiment will serve mainly to determine the value of this method for subsequent variety trials. The remainder of the seedlings have not reached this stage and are still in process of being multiplied and tested for their resistance to Panama Disease.

No extensions to nurseries have been carried out during the year though with the increased output of seedlings which is expected in the near future such extensions will shortly become necessary. The S.19 plantings at Coleraine have borne well in the ratoon crop and several shipments of fruit have been delivered to the Government Low Temperature Research Station for Cold Storage Trials. These plots, for this reason, and also on account of the inaccessibility of the fruit are no longer being used for breeding. The 1-acre plot at Borobridge in this variety continues to give fruit which is also being used for cold storage tests.

As has been stated before, the plots at Chepstowe and Guys Hill failed to give good fruit and have been incorporated in the breeding programme.

The 3-acre plot of the *Giant Governor* variety at New Yarmouth has grown exceptionally well and commenced bearing towards the end of November. The fruit from this plot will also undergo cold storage tests. A reserve plot of *Cavendish* suckers at Coleraine is being maintained.

11. PANAMA DISEASE TESTS.

No change in the technique for testing the reaction of seedlings to Panama Disease which was described in an earlier report has been found necessary. Inoculation experiments have been carried out with a view to determining the practicability of testing the reaction of seedlings to the disease while still in the early stages of growth. It has been found that the application of inocula growing on agar media to the young growing roots of a small susceptible plant results in infection within a few days. Further work on this method will be necessary however before it can be used even partially to supplant the methods at present in operation.

The 3-acre plot of heavily infected land planted in *Gros Michel* at Orange Hill had, by the end of 1938, 578 days after planting, developed disease in 81% of the standing plants, and has therefore proved very suitable for the purpose for which it was designed. In May, a commencement was made of replacing diseased *Gros Michel* in this plot with seedlings for test and 638 seedling suckers have now been planted there. So far, one variety planted in May has gone down with disease in this plot.

A similar 2-acre test plot at Coleraine is still in use and as seedlings succumb to disease they are replaced by new ones for test. This plot was extended by a further $\frac{3}{4}$ -acre in September, and the extension planted in *Gros Michel* for use in a similar manner to the plot at Orange Hill.

During the year under review 166 more seedlings have been included in these trials as follows:—

TABLE VIII.

Seedlings undergoing P.D. Test.

Cross.	Seedlings.	Total.
H. x K. ..	238, 242, 243, 271, 272, 285, 304-311, 322-324, 348, 349, 358, 384, 417-419, 421, 450 ..	26
G.M. x Z.A. ..	239, 246, 248, 273, 287, 314, 315, 326-330, 345, 346, 359-362, 413, 422, 424, 426, 452-456 ..	27
F.H. x K. ..	325 ..	1
G.G. x K. ..	253 ..	1
P.J. x K. ..	316, 331 ..	2
G.M. x S.19 ..	252, 312 ..	2
S.5 x K. ..	260, 262, 263, 296, 301, 302, 352 ..	7
S.7 x S.7 ..	292, 293, 321, 325, 350 ..	5
7 x 19 ..	240, 254-256, 278, 333, 334 ..	7
19 x 7 ..	298 ..	1
7 x 20 ..	290, 291 ..	2
20 x 7 ..	282, 283, 336, 337, 356, 363, 364 ..	7
40 x 7 ..	300, 355 ..	2
17 x 20 ..	414 ..	1
17 x 19 ..	297, 318, 319 ..	3
24 x 19 ..	428 ..	1
19 x 19 ..	276, 317, 354, 367-369, 371-372, 374-383, 392, 394-6, 398-404, 407-410, 412, 432, 434, 435, 440, 441, 444, 445, 448, 459, 461, 462, 464, 466, 467, ..	48
19 x 20 ..	286 ..	1
20 x 19 ..	299, 338 ..	2
118 x 19 ..	443 ..	1
S. x 7 ..	365, 366 ..	2
x 19 ..	215, 218, 226, 258, 265, 268-270, 294, 295, 303, 339, 341-344 ..	16
x 40 ..	267 ..	1
		166

As many of these were planted late in the year it is still too early to say how many are resistant to disease. During 1938, a further 12 seedlings have gone down with Panama Disease making a total of 14 out of 158 which had been under test for 7 months or more. These 12 seedlings are constituted as follows:

		Susc. s'ings.	So far immune.
H. x K.	J.285 ..	1	22
J. x Z.A.	J.180, 229, 246, 328, 346 ..	5	17
S. 19 x S. 19	J.125, 167, 178, 190 ..	4	2
S.- x S.19	J.264 ..	1	17
S.5 x K.	J.232 ..	1	13
Other crosses		0	75
		12	146

The proportion of susceptible seedlings (8.8%) is satisfactorily low, and immunity to Panama Disease appears to be inherited as a dominant to susceptibility. Data is still insufficient to provide a key to the genetics of this inheritance but it is hoped that it will be worked out towards the end of 1939.

PAW PAW SELECTION.

12. Efforts to find a species or variety of *Carica* suitable for use as a parent in breeding for resistance to Mosaic disease have met with little success. Of the many forms which have been tested out in the last few years, *Carica cauliflora* and *Carica pubescens* alone have withstood disease, and both of these have

so far proven incompatible in crosses with all varieties of *Carica papaya* with which they have been tried. No resistant varieties of *C. papaya* have been found. Of the crosses which were carried out last year, all the fruit has been reaped, and the seed yielded has been planted with the following results:—

Cross.		Number of flowers pollinated.	Fruit Set.	Seed Yield.	Germination.
<i>C. papaya</i>	x <i>C. papaya</i>	40	33	Abundant	good
	x <i>C. cauliflora</i>	8	4	Poor	none
	x <i>C. pubescens</i>	2	0	..	..
<i>C. cauliflora</i>	x <i>C. cauliflora</i>	8	4	26.0 gms.	fair
	x <i>C. zapota</i>	4	0	..	..
	x <i>C. pubescens</i>	4	0	..	..
<i>C. pubescens</i>	x <i>C. cauliflora</i>	3	3	5.0 gms.	none
	x <i>C. pubescens</i>	6	5	11.0 gms.	fair
	x <i>C. zapota</i>	3	0	..	..
	x <i>C. dolecaula</i>	5	0	..	..
<i>C. chrysopetala</i>	x <i>C. cauliflora</i>	5	0	..	..
	x <i>C. zapota</i>	5	0	..	..
	x <i>C. dolecaula</i>	5	0	..	..
	x <i>C. pubescens</i>	7	0	..	..

From the high percentage of fruit which was set from the cross *C. papaya* x *C. papaya* it is apparent that the poor results from interspecific crosses are the result of incompatibility. Fruit of *C. papaya* x *C. cauliflora* did not swell to the normal size and only yielded inviable, undeveloped seed. The only fertile seed obtained all resulted from intraspecific crosses.

The papaw plot at Hope was replanted in May as most of the *C. papaya* had died as a result of attack by Mosaic disease. This plot commenced bearing in September and the cross *C. papaya* x *C. cauliflora* is being carried out on a larger scale in the hope of obtaining some few viable seed. 173 flowers had been pollinated by the end of the year and 105 fruit showed signs of setting. It is to be remembered however that a large proportion of these will fall before maturing as the fruit produced by incompatible crosses often hang on the tree for 3 or 4 months before dropping.

One more species, *C. candicans* was received from Peru during April, but germination was poor and it proved impossible to establish.

INSECT PESTS.

13. During the absence of the Entomologist on leave, from October 28th to the end of the year, the Botanist acted as Entomologist. No serious outbreaks of insect pest occurred during this period and those outbreaks which were reported proved amenable to control by the usual routine methods. The activities of the Division were mainly concerned with work of an advisory nature though some experimental work has been in progress.

Sugar Cane.—No outbreaks of pests on this crop were reported. The annual survey of incidence of the Moth Borer, *Diatraea saccharalis*, F. in the nursery plots at Hope was carried out in November. The percentage of infested canes was considerably less than in 1937. A separate report on this survey has been submitted.

Banana.—A further consignment of the predatory beetle *Dactylosternum hydrophiloides*, MacL., which attacks the Black Weevil Borer, *Cosmopolites sordidus*, Germ., was received from Malaya and liberated in two heavily infested estates in November.

Citrus.—The 'Fiddler' beetle, *Prepodes vittatus*, L. continued to be the most prominent pest of this crop. A number of outbreaks were reported and planters were advised to collect insects and egg batches and to encourage parasitism of the eggs by the wasp *Tetrastichus haitiensis*, Gahan. Systematic collections, commenced on the Citrus experiments at Grove Place Experiment Station in 1937, have been continued and monthly reports thereon received. So far only seasonal reductions in the pest are apparent. On one estate damage by adult 'Fiddler' was recorded on three previously unreported hosts of this insect, namely, Bitterwood (*Picraena excelsa*, Lindl.), Pimento (*Pimenta officinalis*, Lindl.), and Maroon Wattle (*Trichilia moschata*, Sw.).

Among other citrus pests on which advice was sought were aphids, *Aphis gossypii*, Glover, here one of the Nymphalid *Aganisthos odus orion* F. and the Black Fly *Aeluocanthus woglami*, Ashby. In connection with outbreaks of the latter, distribution of the parasitic wasp *Eretmocerus scrius*, Silv., were made.

Pests of other fruit trees reported and dealt with include scale insects and thrips, *Selenothrips cambricinctus*, Giard. on mango, the wax scale, *Ceroplastes* sp., on sweep soy (*Annona squamosa*, L.) and aphids, *Aphis illinoensis*, Schimer, and the West Indian Red Scale, *Selenaspis articulatus*, Morgan on the grape vine.

Search for specimens of *Dasyscapus parvipennis*, Gahan, a parasite of the mango thrips, which was liberated at various loci in the Liguanea plain, has been made but no specimens were recovered.

More active interest in the control of termites in buildings is being shown by the community and several public buildings where these pests have been reported have been examined and advice given. In connection with the survey of economic termite species in Jamaica further specimens have been forwarded to Washington, U.S.A., for identification.

Other pests causing damage to small crops, ornamentals, stored products and dwellings which have been dealt with include:—

Tobacco	attacked by	cutworms, flea beetle.
Crotalaria	" "	<i>Utethesia ornatrix</i> , L.
Mint	" "	<i>Orthezia insignis</i> , Douglas.
Carnations	" "	Thrips
<i>Argyrea speciosa</i>	" "	<i>Coccus mangiferae</i> , Green
	" "	<i>Selenaspidus articulatus</i> , Morgan.
	" "	<i>Saissetia oleae</i> , Bern.
<i>Murraya exotica</i>	" "	Aphids
Pelargonium	" "	<i>Asterolecanium pustulans</i> , Cockerell.
Lawns	infested with	<i>Solenopsis geminata</i> , F.
Dwellings	" "	Wasps, bats.
Stored grain	" "	<i>Sitodrepa panicea</i> , L.
	" "	<i>Calandra granaria</i> , L.

In connection with the infestation of lawns by ants, experiments are in progress to test various chemicals, particularly dilute arsenicals, in control of weeds and insects generally and in particular of the fire ant, *Solenopsis geminata*, F.

Several insects of no economic importance have been submitted and identified.

14. MISCELLANEOUS.

A separate detailed report has been submitted on the seedlings from the *Highgate* banana and a paper entitled "Banana Development in Jamaica" was submitted to the XII'th International Horticultural Conference, Berlin.

In conclusion it is my desire to express my sincere thanks to the owners, executives and staffs of the various estates who have so willingly co-operated in this work, particularly to Messrs. Agualta Vale Ltd. Hawkins and Scott, Potosi Estates Ltd., P. Junor, Esq., and P. Lindo, Esq.

L. N. H. LARTER,
Government Botanist.
31.1.39.

(xvii.) Annual Report of Plant Pathologist for 1938.

BANANAS—*Gros Michel* (*Musa sapientum*).

Cercospora Leaf Spot.—Spraying and dusting experiments have been carried out as outlined in Bulletin No. 15, with the following alterations and additions.

1. Old Harbour A.—Old Spraying Experiment started by Mr. Smith in January, 1937.
2. Old Harbour B.—Spraying Experiment instituted in August 1937.
3. Maverley. Old spraying and dusting experiment set up by Mr. Smith in January, 1937, but discontinued early in 1938, owing largely to difficulty in obtaining adequate water supply.
4. New Yarmouth A.—Spraying experiment instituted in August 1937, duplicating one being carried out by the United Fruit Co.
5. New Yarmouth B.—Spraying experiment instituted in August, 1937, duplicating Old Harbour B.
6. Molynes Pen.—Dusting experiment with power and hand dusters instituted in November, 1937.
7. Cockburn Pen.—Spraying and cultivation experiment instituted in April 1938.

Experiments A and B at New Yarmouth were abandoned in December, 1938, owing to the following reasons:—

- (1) Loss of control on some of the experimental plots owing to a prolonged break in the spraying cycles on account of the water supply being cut off temporarily. This occurred during a rainy period when the rate of infection was high.
- (2) Complaints from management of estate on account of alleged infection from control plots and guard rows.
- (3) Long distance from headquarters resulting in (a) considerable time spent in travelling and (b) frequent supervision of sprayed plots made difficult.

The above spraying experiments were carried out with Bordeaux and Perenox (a Cuprous Oxide compound) at varying strengths and applied at varying intervals. Controls and guard rows were set up with each experiment.

Spraying experiments at Old Harbour and New Yarmouth with Bordeaux and Perenox at the same copper concentration (on the 4:4:40 basis) and carried out tri-weekly at the rate of 250 gallons per acre, showed that the appearance of the trees and fruit weights compared favourably with Perenox spraying where half of the above copper concentration was used. Where equal copper concentrations of Perenox and Bordeaux were used on the (4:4:40 basis) it was found occasionally, during the early part of the year that the fruit weights of stems from trees treated with Perenox were a little larger than the stems from trees treated with Bordeaux, the quantity of fruit, however, up to the present has been insufficient to draw any definite conclusions. The $\frac{1}{2}\%$ Bordeaux did not give such satisfactory results as the $\frac{1}{2}\%$ Perenox with equal copper concentration, similarly with the $\frac{1}{4}\%$ Perenox, which did not show as good control as the $\frac{1}{2}\%$ Perenox.

In view of these results, spraying experiments were carried out with a Perenox concentration between $\frac{1}{4}\%$ and $\frac{1}{2}\%$ which up to the present have shown promising results. Where inadequate control has been found, due largely to unfavourable weather conditions, it has been found necessary to regain control by decreasing the tri-weekly cycle to a bi-weekly cycle for a few applications. For ratoons, the rate of application has been temporarily standardized to 200 gallons per acre and for young plants 100 to 150 per gallons acre. Further experiments indicate that it will be possible to reduce considerably the present rate of spray application per acre according to the type of disc used on the nozzle of the spray gun.

The amount of spray required per acre also depends largely on type of growth and number of trees per acre.

Owing to the unsatisfactory results of many of the Demonstration Plots which have been dusted, some of the more severely affected plots have been sprayed with Bordeaux and Perenox and it is now proposed to let each Inspector of Plant Diseases be put in charge of one or more (depending upon size) plots to be

sprayed tri-weekly in areas where the Leaf Spot is present. Each Inspector will be supplied with a small 1 H.P. Spraying outfit and some Inspectors have been supplied already. Owing to the difficulty in manipulating Spraying Machines with tanks on wheels on many of the banana growing areas, it has been necessary to have many of these machines adjusted in order that the engine and pump may be detachable and carried by two men from barrel to barrel of spray mixture.

COCKBURN PEN EXPERIMENTAL PLOT.

Ten acres of irrigated land were planted in bananas during the early part of the year and after these plants were a few months old, spraying experiments were carried out with Perenox and Bordeaux similar to the experiments being carried out at Old Harbour. Various leguminous cover crops are also being tried out and a small acreage has been treated with boron.

Spraying Demonstrations and Lectures on Cercospora Leaf Spot and its control have been given in Hanover, St. James, St. Mary and St. Thomas. Large and small types of power and hand spraying outfits have been demonstrated.

INVESTIGATION OF INCIDENCE OF CERCOSPORA LEAF SPOT IN HAITI.

A survey of the chief banana growing areas in Haiti was made from March 15-21st and a full report in this connection was submitted.

PANAMA DISEASE.

Experiments have been carried out with banana suckers before planting as follows:

- (1) Dipping in varying strengths of Perenox at varying intervals.
- (2) Same as (1) excepting that solution was heated up to 112° F -115° F.
- (3) Suckers treated with Perenox where suckers are to be planted which have been (a) dipped previously in Perenox and (b) not dipped previously in Perenox.
- (4) Perenox applied to base of plants at regular intervals.

Up to the present, although the plants are only a few months old, there has been no indication of Panama Disease appearing, although the suckers as treated above were planted on (1) land severely affected throughout and (2) land affected in isolated spots.

The total number of diseased plants treated during 1938, which were affected with Panama Disease, is 854,897 as compared with 800,959 in 1937. These figures are only approximate totals as on account of the severe epidemic of Panama Disease in Portland, this parish was abandoned in 1930 and no records of its incidence in that parish have been kept since that date. Although there has been a continuous increase of Panama Disease from year to year, there has been apparently a considerable decrease in the increase percentage from 1936 as compared with the increase percentage of the previous year.

The figures are as follows from 1935:

1935.	% Increase.	1936	% Increase.	1937.	% Increase.	1938.	% Increase.
415,931	91%	596,442	43%	800,959	34%	854,897	6½%

The small increase percentage in 1938 as compared with previous years is probably largely explained by the fact that in spite of the Inspectors of Plant Diseases doing as much as possible in controlling the spread of this disease, there has not been sufficient opportunity for putting in the required time for this purpose owing to a large portion of the Inspectors' time being taken up with Leaf Spot work which is steadily becoming more of a major part of the ordinary routine of the Inspectors programme. For the time being, therefore, other problems such as Panama Disease, Pimento Rust, Coconut Diseases, Citrus Diseases, Coffee Diseases and various miscellaneous but important diseases, are unavoidably given second consideration and often of necessity very little consideration at all on account of more urgent problems such as Cercospora Leaf Spot.

COLD STORAGE EXPERIMENTS.

Stems from Leaf Spot affected Trees.—The second series of Cold Storage experiments was continued in February in connection with stems from Leaf Spot affected trees. The main object of the experiment was to determine the degree of premature ripening, if any, of fruit from trees affected with Leaf Spot as compared with fruit from trees not affected with Leaf Spot.

An equal number of stems of bananas from trees affected with Leaf Spot and stems from trees not affected with Leaf Spot were put into Cold Storage and remained during the normal cold storage period of 14 days at a temperature of 52°F to 53°F. and afterwards put into a ripening room for a period of 7 days. The stems from Leaf Spot affected trees were from areas where Leaf Spot was present in a mild to severe form and the stems were graded accordingly.

At the end of the cold storage and ripening periods it was found that the fruit from Leaf Spot affected trees compared favourably, as regards normal ripening and flavour, with the fruit from trees not affected with Leaf Spot. The stems, however, from trees affected with Leaf Spot showed a greater tendency towards thin and short fingers than the stems from trees which were not affected with Leaf Spot.

The S.19 Variety. Three series of cold storage experiments were carried out in this connection with particular attention being given to the following points:

- (a) Colour on ripening and evenness of ripening.
- (b) Flavour,
- (c) Texture of flesh,
- (d) Dropping of fingers,
- (e) Degree and nature of bruising,
- (f) Shrinkage and loss of weight of fruit,
- (g) Stalk rot.

In each series, the S.19 variety was intermingled with an equal number of Gros Michel stems. Up to the present, the following observations have been made.

The Gros Michel variety shows a stronger fibrous texture than the S.19 which probably, largely explains why the S.19 shows a greater susceptibility to bruising, stalk rot and a tendency towards finger dropping at the time of ripening as compared with the Gros Michel. The presence of stalk rot, however, did not appear to be so evident on the stems from Borobridge as compared with the stems from Coleraine. Another disadvantage of the S.19, particularly from the point of view of export, is the variation in finger size. Further cold storage experiments with the S.19 have shown that a more consistent evenness of ripening is obtained by remaining in cold storage for 15 days instead of 14 and remaining in the ripening room for 7 days at 68 F instead of the usual 72 F. temperature.

Reports on the above cold storage experiments have been submitted accordingly.

COCONUTS (*Cocos nucifera*).

A form of Leaf Wilt disease similar to that found in other tropical countries, has been found present for several years in a particularly severe form at the western end of the Island and although a rigid programme of control such as disposing of affected trees as soon as the first symptoms appear, has been carried out for a few years, this has also been interrupted owing to the particular Inspector's duties in this connection being largely taken up with Leaf Spot work. Several coconut plots have been taken in the affected areas and planted in coconuts selected from good stock taken from the eastern end of the Island. The object of these experiments is (1) to test out the resistance, if any, of varieties from another source where this disease is not present and (2) to investigate into the application of various soil treatments which may have an effect on the incidence of this disease.

What appears to be a physiological Leaf Die Back is also being investigated at Rio Bueno where a coconut plot has been established and where cover crops and fertilizers have been established.

LIMA BEAN (*Phaseolus lunatus macrocarpus*).

A form of "Yellows" has been investigated and which was at first considered to be caused by a virus now appears to be of physiological origin and affected by seasonal differences. This condition of the leaf tissue was found present during the drier and warmer months.

GROUND NUT OR PEANUT (*Arachis hypogaea*).

Affected by Rust caused by *Puccinia arachis*, but only in isolated areas and not of sufficient importance to warrant the application of control methods.

PIMENTO (*Pimento officinalis*).

Pimento Rust.—Caused by the rust fungus *Puccinia psidii* has caused a serious decrease in pimento yields since 1934. The severe form of infection is present at altitudes over 2,000 feet whereas below 1,000 feet the casual organism does no material harm. The use of fungicides is on the whole impracticable. Some control has been found where Bordeaux has been applied on the younger trees.

CITRUS.

Withertip.—This has been largely confined to the West Indian lime (*Citrus aurentifolia*) and often found on the older and less vigorous trees. Pruning and adequate cultivation methods have helped to control this disease. A species of *Gloeosporium*, is associated with this disease.

SUGAR CANE (*Saccharum officinarum*).

Leaf Spot.—Caused by *Cercospora vaginæ* has been found present on var. BH.10-12, but only in isolated areas and of insufficient importance to warrant the use of control methods.

COFFEE (*Coffea arabica*).

American Blight.—Caused by the agaric fungus *Omphalia flavida*, the conidial stage of which is *Stilbum flavidum*. This was found present in the Blue Mountain area, but has only appeared in a moderate form during rainy periods. Spraying methods have been recommended together with the improvement of cultivation methods in the affected areas where considerable soil erosion is present.

PINEAPPLE (*Ananas comosus*).

Leaf Base Rot.—Caused by the fungus *Thielaviopsis paradoxa* and is usually present during prolonged wet weather conditions. This disease may be controlled by growing varieties such as the "Red Spanish" and "Cow Boy" which up to the present appear to be resistant to this disease. The "Sugar Loaf" variety is susceptible to this disease.

The following economic and ornamental plants of minor importance have been reported and control measures recommended accordingly.

MINOR ECONOMIC PLANTS.

Sisal (*Agave sisalana*) showed the presence of a *Gloeosporium* Leaf Spot.

Sweet Pepper (*Capsicum frutescens*) showed the presence of a leaf spot caused by *Cercospora capsici*.

Yams (*Dioscorea* spp.)—The white yam (*D. alata*) and yellow yam (*D. Cayennensis*) showed the presence of a leaf spot which appears to be caused by *Gloeosporium pestis*.

Paw-Paw (*Carica papaya*) showed the presence of Mosaic which appears to be due to a virus,

ORNAMENTAL PLANTS.

(1) *Rose*. (*Rosaceae*) showed the presence of Black Spot caused by *Diplocarpon rosae*.

(2) *Canna*. (*Scitamineae*) showed the presence of a Rust disease caused by *Puccinia helianthi*. The "President" variety shows resistance whereas the yellow and dark red varieties are not resistant.

(3) *Carnation* (*Dianthus*) showed the presence of Witches' Broom disease which appears to be of bacterial origin and caused by *Bacterium tumefaciens*.

F. S. WARD.

24.2.39.

(xviii) Report of Agricultural Officer in charge of Inspection of Imported Plants, Plant Products and Agricultural Machinery for 1938.

Low Temperature Station,

West End, Kingston,

21st February, 1939.

1. During the year the inspection service was carried out by me except for one occasion on which I was absent on two days' sick leave, when Mr. Z. A. Daniels acted in my stead.

2. Inspection of Fruit and Vegetables:—

Passed for consumption in Jamaica	..	..	9,291 packages.
Passed for transshipment	..	..	320 "
Not admitted	..	..	76 "
			9,687 packages.

Most of the imported fruit and vegetables were from the United States of America and consisted chiefly of apples, grapes, plums, pears, lettuce, celery, cauliflower. There were, however, a large consignment of apples from Canada (756 boxes) and one from New Zealand (2,000 boxes) during the year.

The packages refused entry consisted mainly of vegetables on which aphids were present, and prohibited fruits—citrus.

PESTS AND DISEASES.

In the early months of the year, lettuce and celery were found frequently to be infested with aphids and in March 33 crates were re-exported for that reason. In the summer, there were a few cases of the occurrence of celery blight which was never serious at any time. On isolated occasions there were also noted:—Codling moth larva, Peach twig borer, Mealy Bug on peach, Chrysomelid beetles on lettuce.

3. Inspection of Imported Plants:—

Passed	..	..	419 packages
Destroyed	..	..	18 "
Re-exported	..	..	2 "
			439 packages.

The bulk of plant importation was from the United Kingdom and the United States of America, though other consignments arrived from Holland, Canada, France, South Africa, Kenya, India, the Philippines, Siam, Straits Settlement, Australia, Hawaii, Trinidad, Barbados, St. Kitts, Colombia, Guatemala, Bermuda, Costa Rica and St. Lucia.

PESTS AND DISEASES.

Apart from the usual storage rots and moulds, there were no diseases on the plants, and in only a few instances were there any pests. On one occasion, termites in a consignment of rose plants from the U.S.A. were destroyed by the Entomologist; occurrence of aphids, mealy bugs and scales were also noted.

SEED POTATOES.

4. Importations of seed potatoes dealt with were as follows:—

Country of origin.	Passed.	Condemned.	Total.
Canada	5,537	..	5,537
England	2	..	2
N. Ireland	1,964	125	2,089
			7,628

A high standard, as regards freedom from pests and diseases, was maintained with seed potatoes imported from Canada; in the case of importations from N. Ireland, however, there was always a relatively high percentage of waste due to bacterial soft rot, probably developed during storage and transportation.

AGRICULTURAL MACHINERY.

5. Used agricultural implements were imported on six occasions; disinfection with Jeyes Fluid was carried out before delivery in each case.

On three occasions, used sugar machinery was allowed entry in order for repairs to be carried out in the Island.

MISCELLANEOUS.

6. Other items of agricultural importance inspected during the year included:—
 2 pkgs., flower pots of hollowed tree fern from St. Kitts—allowed.
 2 “ mushroom spawn from U.S.A.—destroyed.
 1 pkge. Osmunda fibre from U.S.A.—allowed.
 1 “ mushroom spawn from England—allowed.

HEALTH CERTIFICATES.

7. There were 110 Health Certificates issued, plants being exported to:—the United Kingdom, the United States of America, Canada, the Bahamas, Bermuda, Guatemala, Panama, Colombia, Costa Rica, Canal Zone, Trinidad, Haiti, Tanganyika, Kenya, Ceylon, the Philippines, India and Hawaii.

EGBERT A. TAI,
Agricultural Officer.

D. PUBLICATIONS.

The following Departmental publications were issued during the year:—

Bulletin No. 13 (New Series)—“Report on an Agricultural survey in the Cayman Islands,” by W. H. Edwards.

Bulletin No. 14 (New Series)—“Proceedings of the Summer Course of Lectures and Demonstrations, 1937.”

Bulletin No. 16 (New Series)—“A Survey of the Yields of Sugar Cane in Jamaica, 1936-37.” Report by H. H. Croucher.

Bulletin No. 17 (New Series)—“Soil Erosion and Conservation in Jamaica 1937,” by H. H. Croucher and C. Swabey.

Annual Report—1937.

Bulletin No. 2 (Staff Series)—“Proceedings of Annual Staff Conference, 1938.”

SECTION III.—FINANCIAL STATEMENTS.

HOPE STOCK FARM, YEAR ENDED 31ST DECEMBER, 1938.

CASH APPROPRIATION.

<i>Receipts.</i>	<i>Approved</i>		<i>Disbursements.</i>	
	<i>Estimates.</i>	<i>Actual.</i>	<i>Estimates.</i>	<i>Actual.</i>
	£	£ s. d.	£	£ s. d.
Balance on 31.12.37 ..	1,317	1,937 19 6	<i>Personal Emoluments—</i>	
Milk Sales ..	5,800	7,062 5 0	Accountant ..	150 150 0 0
Butter Sales ..	100	60 18 11	Cashier ..	140 140 0 0
Live Stock Sales ..	100	271 5 0	Farm Superintendent ..	50 50 0 0
Poultry Sales ..	30	37 10 9	Assistant ..	112 111 5 0
Rents ..	200	247 9 6	Asst. Master—in lieu of	
Bombay Mango Sales ..	500	477 0 6	Com. on fruit sales	50
Jamaica Govt. Reimbursement			Contributions in respect	
difference—New Stables Grove			of pensions ..	26 25 10 0
Place ..	256	255 13 9	Foreman ..	180 180 0 0
Miscellaneous ..	400	414 11 9	Labour ..	1,328 1,858 6 2
	8,703	10,764 14 8	Typist and Stenographer	60 46 7 4
			Rent (Comm.)	20 24 15 9
			Fruit (Comm.)	15 7 18 1
			Clerk and Storekeeper	140 140 0 0
				2,271 2,734 2 4
			<i>Other Charges—</i>	
			Food for Stock ..	2,000 2,511 1 9
			Rearing Calves ..	5
			Clearing and Fencing	700 761 9 10
			Purchase of Live Stock	400 429 2 5
			Repair and Maintenance of	
			Buildings, Machinery	
			and Equipment ..	800 702 9 11
			Reimbursement to	
			Treasury on Hope	
			Pasture ..	200 235 8 10
			Travelling ..	25 25 3 5
			Miscellaneous ..	525 604 6 4
			<i>Special Expenditure—</i>	
			New Buildings and	
			Equipment ..	700 358 16 5
				7,626 8,362 1 3
			Balance—	
			In Govt. Savings	
			Bank ..	£658 14 5
			“ Bank of Nova	
			Scotia ..	1,721 14 11
			“ Hand (to be	
			lodged) ..	22 4 1
				2,402 13 5
				£10,764 14 8

N. B. DONALDSON,
Accountant.
20.2.39.

G. A. JONES,
Director of Agriculture.

Dr.

[illegible]

N. B. DONALDSON,
Accountant.
20.2.39.

G. A. JONES,
Director of Agriculture.

HOPE STOCK FARM, YEAR ENDED 31ST DECEMBER, 1938.

BALANCE SHEET.

<i>Assets.</i>		<i>Liabilities.</i>	
	£ s. d.		£ s. d.
Buildings—		Deposits—	
As at 31.12.37 ..	4,883 10 2	As per List attached to	
Additions ..	225 7 3	Trial Balance ..	0 13 10
	5,108 17 5	Accounts Payable—	
Depreciation ..	159 4 7	Treasurer for New York	
	4,949 12 10	Agents ..	79 10 4
Machinery—		Do. Crown Agents	8 9 11
As at 31.12.37 ..	854 19 1		
Depreciation ..	91 8 10	Jamaica Government—	
		Loan o/a purchase of	
Furniture and Fixtures—		Hope Pastures ..	2,600 0 0
As at 31.12.37 ..	1,005 14 6	Less transferred to T.B.	
Additions ..	34 13 11	Hospital ..	1,350 0 0
	1,040 8 5		1,250 0 0
Depreciation ..	81 3 2	Less amount paid off	
	959 5 3	during year ..	235 8 10
Truck—			1,014 11 2
As at 31.12.37 ..	150 0 0	Profit & Loss—	
Depreciation ..	25 0 0	As at 31.12.37	18,864 11 7
	125 0 0	Add Profit for the year	753 1 9
Tools and Implements—			19,617 13 4
As at 31.12.37 ..	274 16 0		
Additions ..	29 1 3		
	303 17 3		
Depreciation ..	58 12 0		
	245 5 3		
Vehicles and Harness—			
As at 31.12.37 ..	190 6 3		
Additions ..	56 2 0		
	246 8 3		
Depreciation ..	31 12 3		
	214 16 0		
Stores and Parts—			
Stock as per Inventory ..			
	121 18 7		
Food for Stock—			
Stock as per Inventory ..			
	653 1 6		
Live Stock—			
Cattle and Horsekind as per			
Valuation ..	7,197 12 6		
Poultry do. do.	40 10 0		
	7,238 2 6		
Accounts Receivable—			
As per List attached to Trial			
Balance ..	758 1 2		
Hope Pastures—			
Cost of Purchase ..	2,286 5 0		
Government Savings Bank—			
"Deposit a/c" ..	658 14 5		
Accrued Interest—			
(On Deposit a/c) ..	3 6 10		
Bank of Nova Scotia "Current a/c" ..	1,721 14 11		
Cash (In hand to be lodged) ..	22 4 1		
	£20,720 18 7		£20,720 18 7

N. B. DONALDSON,
Accountant.

G. A. JONES,
Director of Agriculture.
20.2.39.

SECTION IV.—LEGISLATION.

A.—*Laws relating to Agriculture passed during the year 1938.*

Law No.	Date Assented to.	Short Title.	Chief Provisions.
18	2.8.38	.. The Rum Duty Amendment Law, 1938	(1) Increasing Excise Duty on Rum to 10/8 per Proof Gallon. (2) Increasing Excise Duty on Bay Rum to 10/8 per Imperial Gallon.
22	9.8.38	.. Land Settlement, Island Telephone and other Works Loan Law, 1938	Authorising the Governor to raise the sum of £770,000 by issue of loan for promotion of Land Settlement and other works.
29	18.8.38	.. Agricultural Loan Societies Law 1912 Amendment Law, 1938	Defining powers and authority of Agricultural Loan Societies and Agricultural Loan Societies' Board.
30	19.12.38	.. Sugar Industry Control Amendment Law, 1938.	Amending definition of Island Quotas, Sugar, and giving fuller control of Industry to Governor in Privy Council, further defining powers of Control Board and regulating issue of licenses to Cane Farmers.
40	29.12.38	.. A Law to amend further the Tariff Laws ..	Fixing the rates of Preferential and General Tariff on corn, tobacco and lumber.

B.—Orders, Regulations, Proclamations, etc.

Date.		Description.	Subject.
10.1.38	..	Regulations under Section 31 (1) of the Sugar Industry Control Law, 43 of 1937	(1) Procedure for appeals under Sections 17 (1), 21 (3), 24, 29 (2) and 29 (3). (2) Registration of Cane Farmers. (3) Requiring submission of returns under Section 2, not later than 15th January. (4) Licensing of cane farmers. (5) Prescribing methods to be followed in testing of canes and prescribing standards of sucrose content under section 31 (1). (6) Authorises Control Board to appoint officers for testing scales used for weighing farmers' canes.
10.1.38	..	Order under Section 12 of Law 43 of 1937	Fixing maximum retail prices of sugar for local consumption.
10.1.38	..	Order under Section 9 of Law 43 of 1937	Fixing Quota period and Island quotas for 1937-38 Sugar Crop.
14.1.38	..	Order amending Rule 13 of the Rules and Conditions of Sale of Lands of Government for Land Settlement.	Insertion of words "with such restrictive covenants as the Surveyor General with the approval of the Governor may insert and" between the words "title" and "containing" in the second line of Rule 13.
25.1.38	..	Order under Section 7 of Cattle Contagious Diseases Law 24 of 1890.	Declares Port of Kingston the only port at which foreign animals may be landed save and except when in opinion of Director of Agriculture, circumstances make it advisable that they be landed at other ports.
16.2.38	..	Order under sub-section 1 of Section 2 of Customs Law 1916	Importation of Sisal Fibre prohibited.
24.3.38	..	Regulations under Section 13 of the Agricultural Produce Law 19 of 1926	All unmanufactured tobacco intended for export to be first subjected to examination and treatment by the Officer in control of the Government Tobacco Station. Sets out size, grades and marks of unmanufactured cigar tobacco for export.
29.4.38	..	Order under Section 2 sub-section (1) of the Customs Law 23 of 1916	Importation of Sugar in any of its commercial forms prohibited except under Licenses according to provision of Section 4 (a) of the Sugar Industry Control Law 43 of 1937.
16.6.38	..	Order under Section 16 of Law 43 of 1937.	Permitting export of Island Reserve Quota for 1937-38 during the period 1st September, 1938 to 31st August, 1939.
4.7.38	..	Order under Section 13 of Agricultural Produce Law 19 of 1926.	(1) Adding "Tangerine" to the 6th Schedule of the Law. (2) Revoking regulations relative to buying, selling and exporting of citrus fruit and substituting new Regulations therefor. (3) Revoking regulations governing the export of Limes and substituting new regulations therefor.
29.7.38	..	Order under Section 2 sub-section (1) of Customs Law of 1916.	Excepting Turks and Caicos Islands' grown Sisal from importation prohibition.
10.9.38	..	Notice under Section 2 (8) of Law 23 of 1916.	Prescribing conditions under which transhipment of citrus from Spanish and British Honduras will be allowed at Port Antonio.
11.10.38	..	Notice on sale of Government lands for Land Settlement.	Setting our rules and conditions of sale of lands acquired by Government for Land Settlement in substitution of Rules and Conditions made 30.11.36.
11.10.38	..	Regulations under Section 31 (1) of Law 43 of 1936.	Regulations empowering the Sugar Control Board to appoint an officer or officers to inspect cane cultivations of registered growers and demand returns.
15.12.38	..	Regulations under Section 16 sub-section (1) of Forest Law, Law 43 of 1937.	Rules governing the removal and making of Timber cut from trees referred to in Schedule 1 of the rules.
24.12.38	..	Notification under Law 43 of 1937 and Law 30 of 1938.	Form II in schedule to Regulations made by Governor on 10.1.38 rescinded and a form substituted therefor.
24.12.38	..	Order under Section 3 of Law 30 of 1938.	Fixing Island Quotas and Quota period for 1938-39 Sugar Crop.

